AN

ESSAY

Towards the Recovery of the

Jewiſh Meaſures & Weights,

Comprehending their Monies;

By help of Ancient Standards, compared with ours of *ENGLAND.*

Uſeful alſo to ſtate many of thoſe of the *Greeks* and *Romans*, and the *Eaſtern* Nations.

By *Richard Cumberland*, D.D.

Ex ædibus Lambeth.
Octob. 12. 1685.

IMPRIMATUR.
Jo. Battely, *R.Rmo. P.Domino* Wilhelmo *Archiep.* Cantuar. *à Sacris Domeſticis.*

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To the Honourable

SAMUEL PEPYS *Esq*;

Secretary of the Admiralty of *England*, and Presi-dent of the *Royal Society*.

SIR,

BEcauſe the *Improvement of Natural Knowledg, for which the* Royal Society *was founded, may be attained in ſome degree, by recovering ſome parts thereof, which the Ancients had, but are now un-*

known ; I thought it not improper to preſent to you, who deſervedly preſide in that Illuſtrious Society, this Attempt, to reſtore thoſe eldeſt Standards of Meaſures and Weights, which are mentioned in the moſt ancient Records, the Sacred Scriptures, as commonly known when they were written. But ſuch hath been the ignorance and careleſneſs in theſe Matters, of many intervenient Ages, by whoſe care theſe things ſhould have been tranſmitted to us their Poſterity, that moſt of our late diligent Enquirers have declared their Opi-

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nion to be, that tho the retrieving of them be highly desirable, yet that success in such an endeavor is scarce to be hoped.

Nevertheless, being desired by some Learned Divines of our Church, in subserviency to some brief Annotations on the Bible *by them intended, to do the best I could in this Affair, I have by this Treatise attempted to rescue this most ancient and useful Piece of Learning, from the Grave of Oblivion and Neglect, into which many despairing Men were casting it, before it was quite dead, or past recovery.*

Learning *I call this Knowledg of Weights & Measures, because the first Constitution of them, and the Reason, and Proportions contained in their mutual Correspondencies, do import, not only prudent Observation, which is Learning's Foundation, but also some Elements of Geometry, Arithmetick, and Statick, (which are essential Parts of its Superstructure) thence peculiarly called* μαθήματα, *or* the Learning. *And for this cause I have been forced, in the prosecution of this Enquiry, to call in to my assistance some of the easiest*

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Mathematical Notions, which are as old almoſt as Mankind, aſſociating thereunto ſome Obſervations of Nature, whoſe conſtancy from the beginning gives reaſon to believe that they were known early by Men, together with the eldeſt Works of Art remaining in the Pyramids, Shekels, and other remains of Eaſtern and Weſtern Antiquity, that from the concurrent Evidence of theſe Aged Witneſſes, I might be enabled to give this my Verdict, which is now brought in before you.

Ancient I may well aſſert

this kind of Learning to be, ſince it appears by Moſes's *Deſcription of the Ark by its Meaſures, that the Cubit was in uſe before the Flood. And amongſt the Kingdoms founded after the Deluge,* Egypt *will claim very great Antiquity, being by Scripture called the* Land of Ham, *whoſe Son* Mizraim *is found in the eldeſt Monuments of Time, in the Head of its Kings. But here,* Proclus *aſſures us, the Art of Meaſuring was cultivated in the eldeſt Times; whence we juſtly conclude this to have been part of*

that

that Wiſdom of the Egyptians, in which St. Stephen *affirms* Moſes *to have been univerſally skilled.*

The great Difficulty of finding out the exact Truth in this Caſe, that is perplext between the deſpair of many; and the contrariety of Opinions of other Authors, will plead ſufficiently for the Pardon of ſuch Defects, as after my utmoſt Endeavour, to clear this matter by deciſive Evidence, both a Priore, *and* a Poſteriore, *may yet be diſcovered in this Diſcourſe by your piercing Eyes, or by the curious Examination of the*

Mem-

Members of the Royal Society, to whoſe Cenſure I willingly ſubmit it.

Neverthelefs I cannot but hope, that this Eſſay of mine will be kindly received by you, even on account of your conſtant love to its Author. For that good Affection being begun in your Youth, thirty Years ago, in Magdalen-Colledg *in* Cambridg, *you have continued to this day, while you have gradually riſen higher in the Favour of our two* Great Monarchs *ſucceſſively. And I may juſtly reckon, that nothing can break that Friend-*

ſhip,

ſhip, which ſo great Advantages of Preferment, on your ſide, doth not abate.

Beſides, I believe this Book will be the more welcome into your choice Library, becauſe the Subject of it, is not any quarrelſome Intereſt, or diſtinguiſhing Tenet of a Party of Men, *but the peaceable Doctrine of* Meaſures and Weights, *which in their General Nature, are the Common Concern of all* Mankind; *as being the neceſſary Inſtruments of juſt Dealing, and fair Commerce between all Nations; which the Admiralty of* England

(*wherein*

(wherein you are ſo highly truſted) doth promote in Times of Peace, as it ſecures our Safety in Times of War. For I may without any arrogancy affirm, that not only the Principles and Method of this Diſcourſe, do give Light to that General Doctrine, but alſo that the particular Meaſures *and* Weights *therein ſtated, have an univerſal influence thereupon. Becauſe theſe being the moſt Ancient and Sacred Examples of that kind, and the Rules of that Righteouſneſs, whereof* Noah, *the Father of all Men now*

living,

living, was a Preacher, it's highly probable that all Nations did derive as their Pedigree from him; ſo their Meaſures *and* Weights *from the imitation of his, (although length of Time, neglect and corrupt Cuſtoms, have made great Alterations) which I have briefly proved by the Examples of thoſe uſed by the moſt Learned Nations, the Greeks and Romans.*

But whatever the Succeſs of my Labours may be as to the Subject or Matter of this Tract, I am ſecure, that the calm manner of my writing

ting it will be very agreeable to the known Candour and Serenity of your Temper: For I have induſtriouſly avoided all appearance of Contention againſt any Man that may herein differ from me, ſo far as not to name the known Diverſities of Opinions of Men about this Matter, and have employed all my Diligence to prove mine own Aſſertions, either by Arguments peculiar to them, or by ſhewing the Approach of Others of the beſt Reputation to agreement with me.

By this means, and by refuſing to make ſpecial application

tion of the Generals here ſtated, to the many Texts of Scripture whereunto in the Annotations *they muſt be applied, I have contracted my Thoughts into ſo ſmall a Book, that it may ſeem incongruous to preſent it to a* Man *of ſuch great Worth as you are: For which I ſhall add no other Apology than this, That if in this little Room mine Undertaking be not well performed, the ſhorter Follies are the better; if it be, I know you will not think the worſe of a Book, becauſe in a few Sheets it determines many and great*

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Difficulties. However, if it were never so great, and never so well written, I should think it insufficient to answer those great Obligations under which I am to be,

Honoured Sir,

Your most humble

Servant,

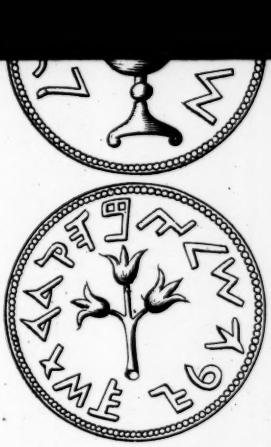
Octob. 28. 1685.

Ric. Cumberland.

The Side of a Cubic
Epha

Inc: 10,944 **A Span** *or*
half Cubit.

A Shekell
with Samaritan
Characters.



Inc: 3 ,648 **A Palme** 3 *of them in the half Cubit.*

dec: Inc. 3 ,912 **A Digit** 4 *of which make a Palme.*

OF

Scripture-Weights and Measures.

CHAP. I.

The Reasons, general Principles and Method of this Enquiry.

THE knowledg of Jewish Measures and Weights, hath been so much neglected by most Men; partly, as exceeding difficult, if not impossible to be attained; partly, as not necessary: that I cannot hope to persuade the generality, even of Scholars to study it; but find it needful rather

to give an Apology for this attempt to ſearch them out.

I obſerved a conſiderable part of the old Teſtament to be employed in deſcribing carefully the Meaſures of *Noah*'s Ark, of the Tabernacle; and the Ark of the Covenant therein kept; of *Salomon*'s and *Ezekiel*'s Temples, with their ſeveral parts, and ſacred Utenſils thereunto appertaning. I perceived therein the moſt antient, beautiful, and magnificent proportions of Architecture to be recorded; and the uſefulneſs of ſuch Buildings to maintain God's publick Honour and Worſhip to be ſuggeſted. I could not but obſerve, that near a thouſand Years diſtance from *Moſes*, *Ezekiel* requires the true old Cubit, *Epha*, *Shekel*, and *Gerah*, to be uſed at the Reſtauration of the Church and State, by him propheſied of.

Theſe appearing in the Text to have been ſo long kept unaltered; I thought they, or ſome of them, might be ſpread into other Places, and by the careful methods of God's Providence, or the diligence, of the Learned, eſpecially Teachers of his Church, among

mong the Jews or Christians: that the memory of them might be preserved above 1000 Years more, in order to our more satisfactory understanding of the old Testament, which was written for the use of the Christian Church to the end of the World, *Rom.* 15. 4. 1 *Cor.* 10. 11.

I was confirmed in these hopes, by considering that the Roman Foot Quadrantal and Congius in Measures, and their Ounce and Pound (as *Villalpandus* proves) in weight, have continued near 2000 Years. And I saw reason to believe, that the Egyptian Cubit had been preserved there, from the utmost Antiquity of the Pyramids unto this day.

Moreover, I considered, that this Enquiry was the fitter for a Minister of God's Church; because the Priests were antiently appointed to be Keepers of the Standards, or Overseers of all Measure and Weight, 1 *Chron.* 23. 29. Wherefore, for exercise of my Arithmetic and Geometry; I resolved, in my younger days, to try what service they could do me in this Search: and having made then some progress

in this Study, I have been perſuaded now to add my riper Thoughts thereunto, for the ſervice of a Commentary on the Bible, deſigned by ſome Learned Clergymen of our Church.

The Principles on which I proceed are,

I. Standards of Length and Capacity, that may ſtill be ſeen, and compared with ours: to which I joyn Antient Shekels, which being both Weights and Coins, are preſumed to have been tried and found agreeable in the Ballances with Standard-weight; and therefore are to our purpoſe equivalent to Standards: all theſe atteſted by credible Perſons, who have ſeen them, and compared them with ours.

II. Arithmetical Principles of Reduction, which are demonſtrable, and acknowledged true by all competent Judges. The firſt Principle bears upon Senſe, aſſiſted by Mechanical Geometry; the ſecond upon Reaſon, uſed in the moſt ſimple and abſtract Objects thereof, *viz.* Number and Meaſure. The

The Method I have taken is moſt natural.

1. To conſider the Meaſure that relates to meer Length, the firſt or moſt ſimple Dimenſion which determines Breadth; alſo if the length of two ſides of a Parallelogram be given.

2. Hence to procced to Meaſures of Capacity, which have three Dimenſions.

3. Laſtly, to conſider Weight, which ſuppoſes a ſolid Body, but ſuperadds the notion of Gravitation in a Ballance wherein two heavy Bodies are compared.

As to a ſtandard of Length, I conſidered, that although the Ancients often ſpeak of the breadth of Barly-Corns to determine it by, and might probably uſe them at firſt to determine a Digit by ſix of them, as the firſt perfect Number; and then by Nature's four Fingers on a Hand, come to determine a hands-breadth, and by ſix of theſe, a Cubit: yet they muſt neceſſarily find, in the firſt Age, as now, variety, or inconſtancy in theſe Productions of Nature, and therefore muſt ſoon

ſee a neceſſity of ſetling a Standard-digit, Hand-breadth, and Cubit, either by mutual Agreement, or rather by the Authority of the Father of the Family, the moſt natural Governour.

Accordingly we find a Cubit mentioned in the building of *Noah*'s Ark, by which all its Dimenſions are determined, and a great number of equal Cubits muſt be put into the hands of the multitude of Workmen, which muſt be employed in building ſo great a floating Veſſel or Ship; and their Cubits muſt be made to agree to ſome Standard, or common Meaſure, elſe the parts of it would be unfit to join to each other, and could not be made to ſerve the common End of them all, the preſervation of *Noah*'s Family, and the other living Creatures therein to be included.

This Agreement of the Oriental Meaſures in their Digits, and conſequently in their Palms, and Cubits of the ſame number of Palms, is expreſly delivered by *Abulfeda*, in words cited by *Greaves*, in the Preface to *Abulfeda*'s Deſcription of *Choraſmia*, which

which he hath ſet out: where although he acknowledgeth, that Cubits of eight Palms were uſed by the Ancients, and of ſix by later Writers; yet he affirms, that in their Digits they all agreed, and their Miles and Paraſangs determined by them, were juſt the ſame, although expreſſed in a leſs number of Cubits, when they uſed a Cubit of eight Palms, and in a bigger number of Cubits, when they uſed that of ſix Palms.

On theſe Grounds I judged, that if we could recover one old Eaſtern Standard Cubit, of a known number of Hands-breadths, we ſhould be able to determine all their Meaſures of length by that Standard. Such I conceive and think I have prov'd the Egyptian *Derah*, or Cubit, ſtill kept at *Cairo*, to be, whoſe length is evidently ſix Palms. And this Mr. *John Greaves*, Aſtronomy-Profeſſor at *Oxford*, in his Book of the *Roman Foot*, hath given us accurately adjuſted, to the 1000 part of our Engliſh Standard-Foot. What uſe this very Learned Man intended to make of this Egyptian Cubit, I find not, but hear-

tily wiſh that he had liv'd to finiſh the Work he intended, about the Meaſures and Weights of the Ancients. The Jewiſh Cubit he hath no where ſtated that I know of; only in his Epiſtle Dedicatory to Mr. *Selden*, he intimates it to be inveſtigable by help of the Roman Foot: how he thence could have deduced it, I know not. But ſince his Death hath deprived us of that great help, which we might have expected from his great Reading, Travels, Diligence, and Judgment; I have thought fit to ſingle out this Cubit, from thoſe many Foreign Meaſures which he hath with equal care adjuſted to our Standards, and to try, by comparing it with the beſt Notices of the Jewiſh Cubit, which my Reading hath ſuggeſted, whether this may not prove of the ſame length with the Cubit of the Sanctuary.

In the ſecond place I have endeavour'd to ſtate the *Epha*, and other Jewiſh Meaſures of Capacity; deducing it from,

1. *A*

1. A fixt proportion to the Cube of the Cubit.

2. From the proportion of a known part thereof to the Standard *Congius* of *Veſpaſian*, ſtill at *Rome:* Beſides other uſeful Methods from the Capacity of Eggs, which the *Rabbins* much inſiſt on; and from the Weight and known Number of ſolid Inches of Water, that would fill either it, or its known aliquot parts.

Only I think fit here to advertiſe the Reader, that he is not to be offended, if he find ſome difference in the iſſue of the ſeveral Methods of inveſtigating the *Epha:* becauſe in all, I pretend not to Mathematical preciſeneſs in determining it; but in ſome have ſtated it as thereabouts. Yet obſerve that the finding it by the ſoild Inches of 1000 Ounces of Water, which is the leaſt, doth not differ a Pint from the biggeſt Content, deduced Mathematically from the Cubits Cube. And this ſmall difference might ariſe, either from the neglect of Workmen, makers of Meaſures, who in making an *Epha* by Cubit-Meaſure, conſider'd not the Cen-

Centesimal parts of an Inch in the Cubit, as my Account doth: or else I may affirm that the Rain-water of those hotter Countries is lighter than our Fountain-water is; and therefore a thousand Ounces of such Water would fill up more solid Inches of room, than so many Ounces of our Water doth: and by either of these ways, the difference of the Accounts may be fully reconciled, or by the concurrence of them both.

Lastly; I descend to consider *Shekel*, and both to state its Weight exactly, and thence to deduce other Weights, and their Value in our present Coin. To which I shall say nothing here, having produc'd, I think abundant evidence in that Chapter, which by help of the harmony in the last Chapter will prove all the other.

By help of this method, I have endeavoured to make this Doctrine, hitherto very intricate and uncertain, more easy, exact, and uniform than I found it; constantly reducing all our Measures of Length and Capacity to Inch-Measure, with its Decimals, as more commonly understood than Foot-Measure:

Meaſure: reducing alſo Weights rather to our *Averdupois*, with its Decimals, than to the *Troy* Ounce; becauſe I have prov'd the Ounce *Averdupois*, to be exactly equal to the old Roman Ounce, and to be juſt equal to two Jewiſh Shekels, the conjunction of two Shekels, I believe, is the true original of it.

By this means, the ſeveral parts of this Enquiry, will help to illuſtarate and prove the truth of the other; the Meaſures of length will clear thoſe of Capacity: and both of them may be proved or reſtored by help of the Weights. Only its requiſite that the Student hereof ſhould be acquainted with Decimal Arithmetic, and a little Geometry; otherwiſe the neceſſary Reductions, and ſome reaſonings here made uſe of, will not be fully underſtood: However ſuch Mathematical Reaſons may ſafely be ſuppoſed true, becauſe they have been examined and found ſo, by the moſt competent Judges in theſe caſes.

CHAP.

CHAP. II.

Of the Ammah, *or Jewiſh Cubit, with the Meaſures thence determined.*

MY deſigned Method obliges me in this Chapter to do three things:

1. To ſhew, that the preſent Egyptian Cubit, is their old one, continued to this day.

2. That the Jews Cubit, or *Ammah*, was of the ſame length with the old one of *Egypt*.

3. To deduce the length of other Jewiſh long Meaſures from hence.

1. This being now in poſſeſſion, is favoured by preſumption that it was ſo always, or in *Moſes* his time; unleſs the contrary be ſhew'd, and the time of the change can be ſufficiently proved. But of ſuch change, or introduction of a new Cubit into *Egypt*, I cannot find the leaſt intimation in Hiſtory: on the con-

contrary, we find it aſſerted by the *Arabians*, *Patricides*, and *Elmacinus*, and the *Nubian* Geographer, whoſe words may be ſeen in *Hottinger*'s *Smegma Orientale*, and other Proofs in *Kircher*, that the *Nilometrion*, or Column divided into Egyptian Cubits, to meaſure the increaſe of the overflowings of *Nile*, are as old as the time of *Joſeph*'s Regency there; yea, and that he firſt made them. Now becauſe the ſame height of its increaſe, *viz.* about 16 Cubits, is agreed in all Ages (*Herodotus*, and the lateſt Writers conſent herein) to have been neceſſary to the fruitfulneſs of *Egypt*; it follows, that this Cubit muſt all along be the ſame, ſixteen leſſer Cubits would be inſufficient, bigger would be prejudicial. Here we have a natural neceſſity to keep to the ſame meaſure from the time of its firſt Conſtitution; and this natural Reaſon is a thing of ſo great conſequence to the welfare of a whole Kingdom, that none can be thought of ſufficient to move any Governour to alter it; nor can the inferiour People have any cauſe, or any ability to make ſuch alteration; the Publick Standards being

being ſo religiouſly kept, firſt in the Temple of *Serapis* (beſides on the *Nilometrion*) and afterwards in the Chriſtian Churches.

Hereunto we may add that which *Proclus* hath ſuggeſted concerning the Neceſſity and Antiquity of Geometry among the Egyptians, that *Nile*, by its Annual overflow, uſed to cover with Mud the common Boundaries of Mens Land, *viz.* Stones, and Trenches, or Ditches; whence it became neceſſary to them, to determine, preſerve, and recover each Man's proper quantity thereof, by exact meaſure of its Area or Surface, which muſt be found, by knowing the length of the Sides, and of the Perpendiculars of Triangles; or of Rectangular Parallellograms, into which any Plot of Ground may eaſily be caſt, to which purpoſe they muſt neceſſarily ſtudy the firſt Elements of Geometry. But I muſt add, that they muſt alſo neceſſarily fix, and Reaſon would adviſe them to be conſtant to ſome Standard-meaſure of length; by the Repetition and Parts whereof, they might determine the lengths of the

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ſides of thoſe Figures that contained their land. And we know alſo that their Cubit was their primary Meaſure: By this they ſetled the length of their κοίνῳ, which *Herodotus* mentions as uſed in Survey, becauſe conſiſting of a known number of Cubits, it ſaved the repeating of a Cubit ſo often, and was eaſily reſolved into the number of which it did conſiſt. Wherefore to make any change in their Cubit would have been very unadviſeable, and apt to endanger loſs in all ſorts of Mens Eſtates, which had been ſetled by another Cubit before. And ſuch change could never be neceſſary, becauſe the firſt ſetled Cubit, and its Parts, would certainly attain all the Ends of exact meaſuring, as well as any other Cubit that could be introduced, and might juſtly challenge to be preferred before any later, by its being ſetled and in poſſeſſion already.

The Strength of this Reaſon may be underſtood more clearly by help of an Example, which I remember in *Herodotus* his *Euterpe*. There he tells us, that in *Egypt* their ſetled Militia conſiſted of theſe two

ſorts

ſorts of Souldiers, who were eſteemed above all Tradeſmen, the *Hermotybie*, and the *Calaſiries*. The full number of the latter of theſe was 250000 Men, who in courſes were their Kings Guards, and every one of them had to maintain him and his Family, Land (free from Taxes) whoſe *Area*, or Superficial Content, was 12 *Arouræ*, each *Aroura* being 100 Cubits on every ſide; which imports that it was the Square of an 100 Cubits. Wherefore to know how much Land this was in our Meaſure, I took the *Cairo* Cubit an hundred times, which is 182,4 in our foot-meaſure, as may be inferred from Mr. *Greaves* his Table: and by ſquaring this Number, I find an *Aroura* to be 33269,76 Square Feet Engliſh; which is conſiderably leſs than one Engliſh Acre, for that contains 43560 Square Feet. Hence it will follow that 12 *Arouræ* will amount to 399237,12 Square Feet. And this divided by the Feet of an Engliſh Acre, will quote 9,165: which demonſtrates that the Land of each *Calaſyry* amounted to 9 Engliſh Acres, and ,165 Milleſſimals of an Acre,

or

or 1 tenth part of an Acre, 6 Cents, *&c.* above the 9 intire Acres: And it's clear that ſo much good Land lying where he places it, might maintain any of them with his Family very well. But if this Cubit were changed, whereby ſo many thouſand *Eſtates* were ſet out, it muſt needs make a great change in all theſe Eſtates, conſiſting of ſo much Land ſet out by this firſt number of Cubits; which are now ſuppoſed to be all altered, and great diſorder muſt be expected among theſe Men in whom the ſtrength of the Kingdom chiefly lay. For if a longer Cubit were taken, thoſe of them that were firſt ſerved, would have more Land in each *Aroura*; but then there would be none left for thoſe that ſhould come to be ſerved laſt; or elſe they muſt treſpaſs upon the Land that did not belong to the Militia, which would beget Diſcontent and Sedition: if they took a leſs Cubit, this would leſſen all the Souldiers Eſtates, more than any Man unskill'd in Geometry can expect, and would beget a Mutiny, for want of a ſufficient Maintenance for the Souldiers and their Fa-

milies, as may appear by this Instance: Suppose that instead of the *Cairo*-Cubit the *Arourae* of the *Calasyries* should be set out by the Roman-Cubit, which is not quite 4 Inches shorter, amounting, in our English Foot-measure, to 1,45, as may be inferred from Mr. *Greaves* his Table. An hundred such Cubits are 145 Feet, and the Square thereof making an *Arourae*, would be 21025 square Feet, and 12 such *Arourae* would be 252300 square Feet, which amount to little above 5 Acres, and three quarters, or Roods. Whereby its evident that much above a third part of every Souldier's Estate would be taken away; whence nothing less than great Distress in all their Families, and Rebellion against their Governors must be expected.

Concerning the Antiquity of these *Arourae*, I cannot find when they were introduced into *Egypt*; For though *Herodotus* do not mention them till he speaks of *Apries* King of *Egypt*, whom Chronologers agree to be that *Pharaoh* who is called *Hophra* in our Bibles; yet he supposes them setled on the Military Men before his Time, and con-

confines them to twelve of those *Nomi*, which are Shires or Præfectures in *Egypt*, of which *Sesostris*, the most Martial King of *Egypt*, was the Author or Founder; which makes me conjecture that he setled these *Arouræ* on the Souldiers, as well as that Division of the whole Land into 36 *Nomi*. If this be admitted, they were much elder than *Moses* his Time, according to the first Book of *Eusebius* his *Canon Chronicus in Græc.* where he from *Africanus*, and he out of *Manetho* the Egyptian Priest, places *Sesostris* in the twelfth *Dynasti*, and afterwards places *Moses* in the eighteenth. Yet they will be of Antiquity sufficient to my Concern, if *Sesostris* setled them about *Moses*'s Time; to which the Learned Bishop *Usher* makes *Sesostris* contemporary. But however this be stated, when I compare 100 Cubits, the side of an Egyptian *Arouræ*, with 1000 Cubits, the side of the Side of the Levites Glebe-land in their Suburbs, and observe the decuple proportion exactly kept between them, I cannot but think both these Measures were used in the same Age; and that

the way of ſetting out Land in the Jewiſh and Egyptian Countries, was near of Kin to each other, which ſerves my main End; although it be more than I was obliged to prove in this Paragraph, where I undertake only to evince that the Cubit in *Egypt* could not eaſily be altered, without making great diſturbance, or making new Meaſures to all their Eſtates hereby determined, which I ſuppoſe I have prov'd.

Beſides, if it had been altered, it's reaſonable to preſume it muſt be by ſome of the great Empires who conquer'd *Egypt*, who would have introduced their own Cubit: but that was not done, for the Babylonian Cubit of five Palms is ſhorter, that of ſix Palms the ſame with this (as we ſhall hereafter ſhew) and ſo needed make no alteration. The Greek and Roman Cubits are known to be ſhorter alſo than this: and the Turks, under whom they now are, have not introduced their Pike, corrupted of πηχυς or Cubit; for whereas there are two Standard-Pikes at *Conſtantinople*, they are both much longer than this now

now at *Cairo*, as may be ſeen in Mr. *Greaves* Table of *Meaſures*, compared with the Roman & Engliſh Foot.

I ſhall add, as over-weight, to conclude this firſt Aſſertion, a probable Argument founded upon this probable Principle; that the Ancient Architects, being left to their liberty of deſigning the outmoſt Lines of a ſtately Building, would chuſe to determine them by ſome round even Number of the moſt known Meaſure whereby they wrought. So God himſelf deſign'd the Ark's Dimenſions in ſuch numbers of Cubits; its length 300, its breadth 50, its height 20; all round even numbers: the like even numbers we find choſen in the meaſures of the *Temple*, 2 *Chron.* 3. 3. length 60, breadth 20 Cubits; and the Oracle a perfect Cube of 20 Cubits in length, breadth, and height, 1 *Kings* 6. 20. So the Learned *Greaves* found the Marble Stones of the Pavement of the moſt accurately built *Pantheon* at *Rome*, the larger of them preciſely three Roman Feet, the leſs of them juſt half ſo much: which ſhews they took care to determine them preciſely by their

moſt known Meaſure, the Foot, or its moſt obvious part, the half Foot; and though the Number be not even, yet conſtant reſpect is had to even Feet, or equal diviſion into Halves. Such reſpect therefore I hoped to find the old Egyptians to have had to their Meaſure the Cubit, in building the greateſt Pyramid, and in determining the outward Meaſures of the Tomb contained in it.

Wherefore, remembring that Mr. *Greaves* had given us exactly in our Engliſh Foot-Meaſure, the ſides of the Baſe of the greateſt Pyramid; and the length of the Tombſtone contained in it, both which fall into odd Numbers and Fractions of our Meaſure, by which they were not deſigned; I reſolved to try the Reduction of this Foot-meaſure (which he had taken) into *Cairo*-Cubits, and I found them both to fall into round very convenient Numbers of *Cairo*-Cubits, making very reaſonable allowance for ſuch ſmall error, as may juſtly, or rather neceſſarily be ſuppoſed to have fallen out, either in the firſt meaſuring of the Pyramid's Baſe, or in the late mea-

measuring which Mr. *Greaves* performed, and I least suspect.

Particularly, First, the sides of the square Base of the greatest Pyramid are delivered, *p.*68, of his *Pyramidographia*, to be 693 English Feet. For reduction these must be divided by 1,824, which is his length of the *Cairo*-Cubit in our foot-measure, the quote is, 379,934, which is so very little short of 380 *Cairo*-Cubits, that I think it reasonable to believe, that the old Architects designed just this even number of Egyptian Cubits. For if we suppose Mr. *Greaves* to have missed but ,12 of a Foot, which is not one Inch and an half in taking this long Measure of near 700 Feet, then the side must be put 693,12: this Number divided by 1,824, will give precisely, 380.

Or rather, if we suppose the old Architects Cubit to have been but one thousanth part of a Foot shorter than the present Standard (and such error is scarce perceptible by Mens Eyes, and there is greater difference in allowed Measures try'd by the Standard, and ordinarily used) its demonstrable that such a Cubit being

repeated 380 times, would make the ſide of the Baſe ſhorter than now it is found; for 380 multiplied into 1,823, produceth but 692,74, which is ſhorter than Mr. *Greaves* hath found it. Wherefore ſince ſuch ſmall difference from Mathematical Exactneſs of Computation muſt neceſſarily fall out, in deſigning ſuch vaſt Foundations, either from imperceptible difference in the Meaſure applied, or from inequality of Ground, or overſight of Workmen: I conclude, that the Meaſure at firſt intended, was juſt 380 Egyptian Cubits. And I incline to it the rather, becauſe the Square of this Number, which is the *Area* of the Pyramid's Baſe, is as remarkable a Square as can be pitch'd upon in the whole Table of Powers of Number, *viz.* 144400, and might therefore more eaſily pleaſe the mind of the Deſigner.

2. In like manner I remembred, that *Greaves*, p. 96, 97, gives the length of the Exteriour Surface of the Tomb, contained in the midſt of the greateſt Pyramid, to be in our Foot-meaſure 7,296. This reduced into

Cairo-

Cairo-Cubits, by dividing by 1,824, gives juſt four ſuch Cubits: and if there be found a difference in the Milleſimal Parts of the Foot-meaſure, (which I cannot now correct, having not the Book by me, but my own Notes taken out of it) I am ſure it is leſs than a Barly-corns breadth.

Wherefore that Tomb, or Stone-Coffins length, may reaſonably be judged to have been deſigned juſt four of their ancient Cubits. And this deſignment could not agree ſo exactly with the ſame number of their preſent Cubits, unleſs the old Meaſure had been continued unto this day. Thus this Tomb will preſerve to us the old Egyptian Cubit, four times repeated, as the Monument of *Coſſutius* at *Rome* preſerves the old Roman Foot: but with more ſignificancy concerning the uſual proportion obſerved of old in humane Bodies; that in moſt comely ſhaped Bodies, the length, from the Elbow to the Fingers end (called a Cubit) being four times repeated, gives the Stature or Tallneſs of a Man. And the differnce between the length of the hollow part of this Coffin, fitted

ted to his Body that ſhould lie therein; and the length of its exteriour Surface might inſtruct the beholders how much ſhorter he was than thoſe elder and taller Men, from whoſe Arms, it's credible that the Egyptian Cubit was taken at the firſt; this difference was very near an Engliſh Foot.

Upon review of both theſe Inſtances, I cannot believe that the old Egyptian Builders of this Pyramid and Tomb, could make them by chance to agree with ſuch well-choſen even Numbers of the *Cairo*-Cubit, if the ſame Meaſure had not then been in uſe, and had not guided them in their Work; it being ſcarce poſſible that they ſhould deſign and work by ſome other Meaſure, and pitch upon other fitting Numbers of ſuch Meaſure, and yet that the Work remaining ſhould ſo juſtly agree with both other well-choſen Numbers and Meaſures, and with theſe alſo.

For proof of the ſecond Propoſition, *viz.* That the Jews Cubit was of the length or meaſure with the old (or new) Egyptian, I offer ſome general

neral Evidence from Hiſtorical Obſervation of theſe and older Times, uſeful to this and other Meaſures.

2*dly*, Particular Evidence.

1. The Moſaical Hiſtory aſſures us, that the Jews Progenitors went into Egypt, a then flouriſhing Kingdom, in the condition of a Family of about 70 Men, and were there Subjects at the beſt, who muſt uſe in all Commerce, the legal Meaſures of the Kingdom in which they dwell, and not long after were made Bondmen, who cannot be ſuppoſed to be allowed to make Laws to keep diſtinct Meaſures and Weights from the Nation which they ſerve. This little and low Eſtate they were in about 200 Years before their deliverance, and therefore muſt needs know the Egyptians Meaſures, but cannot be preſumed (and proof there is none) to have any diſtinct peculiar to themſelves.

Wherefore *Moſes* often mentioning in his Laws, Weights and Meaſures, muſt needs mean, and by the *Iſraelites* be underſtood to ſpeak of ſuch as they know before in *Egypt*: for

for he never constitutes in his Law a new Cbit or *Epha*; and therefore presumes them to know what Measures those words signify, by former use of them. Now it's evident that they and their Fore-fathers for above 200 Years must needs use the Measures of that Kingdom in which they were Subjects, and in whose Markets they must buy and sell for so long a time.

And certainly it was neither unlawful nor dishonourable, in any comparison with Slavery, to use the publick Measures of a Kingdom, famous for greatest skill in the Art thereof: on the contrary, *Moses* is celebrated for being skilful in all Egyptian Learning, of which Geometry and Arithmetick, both used in measuring, are the best parts.

Nor were the Jews so shy of imitating Egyptians, but that they did many of them receive a strong tincture of their Idolatry, their greatest degeneracy; and therefore would more easily comply with them in so lawful a practice as the use of their Measures was.

Besides,

Beſides, to take away all ſtumbling at this, I conſider that it's highly probable that the Egyptians received their Meaſures from their firſt King's *(Mizraim)* Authority, and he received them from his Anceſtors, *Ham* and *Noah*: and ſo, I believe, did both *Abraham*'s Family receive the ſame Meaſure from *Noah*, by the hands of *Sem*; and the *Canaanites*, with whom they dwelt before they came into *Egypt*, by the hands of *Ham*.

That the Philiſtines alſo in *Canaan*, before and after *Moſes* his Time, uſed the ſame Cubit with the Egyptians, may be probably argued, partly from their deſcent from *Mizraim*, *Gen.* 10. 6, 14. Partly from *Herodotus* in *Euterpe* his Affirmation, that the Cubit in *Samos* (which *Bochartus* hath proved peopled from *Paleſtine*, *i.e.* the old Philiſtines) was the ſame with that in *Egypt*. For it's certain, that Mens Children, and the Colonies they ſend abroad, uſe to retain the Meaſures of their Anceſtors.

Thus although the Jews Cubit be the ſame with that of *Egypt*; yet the Iſraelites might uſe it before as well as after

after their descent thither, both receiving it from *Noah* and his Sons.

To which purpose I observe;

1. That there is no evidence that different Measures or Weights were yet introduced into those parts of the World.

2. It's evident by the Bishop of *Armagh*'s *Annals*, that the Kingdom of *Egypt* was founded in the Year of the World 1816, which was 190 Years before the Death of *Noah*.

Now, Civil Government cannot be supposed to be without determinate Measures and Weights: nor is there any reason to believe, that *Ham* or *Mizraim*, in the life-time of *Noah*, could be unacquainted with those which he used, or could see any cause to alter them in his Life-time. They may justly be supposed to have had occasion in that time of 190 Years, to have frequent commerce with him, and his Descendents, dwelling in other Lands: and such Commerce would be facilitated by keeping the same Measures and Weights, but would be made more troublesome by changing them.

3. It

3. It appears by the same Chronology, that from the death of *Noah*, to *Joseph*'s Promotion and Authority in *Egypt*, there were but 283 Years, in which interval no change of Measures, from what *Noah*'s Family used, is read of. And several Arabian Writers affirm, that *Joseph*, during his Regency there, set up the *Nilometrion*, or Column, for measuring the Increases of *Nile*; which Column is now divided by this Egyptian Cubit, and must reasonably be judged from the first to have been divided by the same; because, in all Ages the same number of Cubits, in the overflow, have been esteemed necessary for the judging of Plenty or Scarcity like to follow in that Country. And there is reason to believe, that the Column when divided by him into Cubits, was divided according to a Cubit that had been used and known before his Time, above 283 Years, constancy in these things being usual in all setled Dominions, is to be presumed rather than change, of which there can no proof be offered. And there are many Instances of Measures being pre-

And that his Regency continued 80 Years; so that from his Death to their departure out of Egypt, were but 144 Years, to Moses his Birth but 64 Years.

serv'd

ſerv'd unaltered for a longer time than that, as we ſhall hereafter ſhew.

Now I only ſuggeſt, that the Numeration by Decads, hath been kept among all Nations, that I know of, from the eldeſt times of Hiſtory; and yet it's as alterable by humane Authority, or Agreement, as the Meaſure by Cubits and *Epha*'s, *&c.* or as the Cize of ſuch Meaſures. Now that theſe Meaſures and Weights were of elder uſe than *Jacob*'s deſcent into *Egypt*, may be argued;

1. From the Meaſure whereby *Noah*'s Ark was deſigned, *viz.* round even Numbers of Cubits, and ſuch Cubits as were uſed and known in *Moſes* his Time, elſe it would have been in vain to have deſcribed its Meaſures by a word whoſe ſenſe was unknown. And if *Noah*'s Cubit had been a different Meaſure from the Moſaical Cubit, *Moſes* muſt have reduced that into the then known Meaſure, before he wrote the Hiſtory, which we have reaſon to believe he did not; becauſe it cannot be expected that ſuch diffe-

different Meaſure would, upon reduction, have fallen into ſuch even round Numbers as *Moſes* ſets down; its length juſt 300 Cubits, breadth 50, height 20. The ſame reaſon holds in 16 Cubits height of the Flood above the Hills. So alſo we read of *Sarah*'s preparing three Seahs of Meale, which are an *Epha* (the chief Meaſure of Capacity, and the ſixth part of the Cube of a Cubit, as hereafter I ſhall ſhew) long before the Egyptian Bondage.

We have alſo Shekels, the Original Weight mentioned in *Abraham*'s Time, both in *Abimelech*'s Gift to *Sarah*, as the *Septuagint* and *Targum Onkelos* expreſs it, *Gen.* 20. 16: and in his purchaſe from *Ephron* the Hittite, in the Hebrew Bible, *Gen.* 23. 15, 16. And juſt before *Jacob*'s going into *Egypt*, his Mony out of *Canaan* paſſing by its Weight (which therefore muſt be agreed on) in *Egypt*, *Gen.* 43. 21. And there being no Mark to diſtinguiſh theſe Weights and Meaſures before the deſcent into *Egypt*, from thoſe of the ſame name mentioned by the ſame Writer after it;

it is to be presumed, they signify the same quantities exactly, else the Word must be equivocal, which ought not to be presumed without full proof.

2. For special evidence of the equality of the Jewish & Egyptian Cubit, it will be requisite to reduce this Cubit to our Inch-measure, and Decimals thereof. Whereas Mr. *Greaves* hath given us it from *Cairo*-Standard, in English Foot-measure, thus, 1,824, that is, 1 Foot, 8 Tenths of a Foot, 2 Centesimals, and 4 Millesimals of the same Foot; most Englishmen will more clearly apprehend its length, when reduced thus, 21,888, that is, 21 Inches, 8 Tenths of an Inch, and as many hundreth and thousanth parts of an Inch.

A Geometric Method to exhibit to the Eye, those small parts of an Inch, as in the Scheme hereunto annexed.

The whole Line is an English Foot divided into 12 Inches; each Inch also is divided into Parts called Decimals. Only I have annexed to this Foot, a very short Line, that's but the twentieth part of an Inch, or

,05,

,05, five Centeſimals; becauſe our Foot, with this ſmall addition, is *(proxime)* the ſide of a Cube, containing the true *Epha*, or *Bath*, as I have endeavoured to demonſtrate in its proper place.

The firſt ten Inches thereof, numbred from the right-hand towards the left, are contrived ſo as to be the Baſe of a Right-angled Triangle, whoſe *Cathetus* is but one tenth part of an Inch high, and its *Hypotenuſe* is drawn ſloping from the top of the *Cathetus* to the beginning of the Baſe. The uſe of this Triangle is this; Parallel Lines to the *Cathetus*, taken between this Baſe and this *Hypotenuſe*, with Compaſſes, or obſerved by our Eyes, are true Centeſimal or Milleſimal Parts of our Inch, often mentioned in this Treatiſe: they are Centeſimals, when taken from the juſt Inches of the Baſe; Milleſimals, when from the Decimals of an Inch. So a Perpendicular from 4 in the Baſe up to the *Hypotenuſe*, is juſt 4 Centeſimals: and if it be taken from 8 tenths of an Inch, further towards the left hand, the Perpendicular will be 4 Centeſimals, and 8 Milleſimals

ſimal Parts of an Inch; which being added to 3 Inches, and 6 Tenths, already actually divided on the Line, will give us a preciſe Jewiſh Palm. So 9,912 the Digit, and (Inches) 10,944 is the Jewiſh Span, or half a Cubit; and therefore being doubled, gives the whole Cubit. Wherefore theſe Lengths are marked in a diſtinct Line near the Baſe of our Triangle, that the reductions to Inch-meaſure made in this Diſcourſe, may be more fully underſtood by beginners in this Skill.

Arg. 1. From the Number and determinate meaſure of 6 ſuch Palms agreed generally by Chriſtians, Jews, Perſian and Arabian Mahumedans, to conſtitute the Jewiſh Cubit: The Sum or Reſult of which, agrees exactly with the Egyptian Cubit now ſpecified. Among Chriſtians, I will only mention *Jerom* on *Ezekiel*, and elſewhere generally. The Jews may be ſeen cited in *Arias Montanus* his *Tubal Cain*; in *Waſer*, and *Hottinger*'s Preface to his Book *de Cippis*. Perſians and Arabians own this in generaller terms concerning the Eaſtern Cubits,

Cubits, elder and later, as *Greaves* hath produced them in his Tract of the Roman Foot, and his Preface to the Deſcription of *Choraſmia*, by *Abulfeda*.

I avoid the diſpute about different Cubits; it ſeems to me all founded in the more indefinite ſignification of *Ammah*; which it's certain from the Arabic, ſignifies often generally any Meaſure, whereby the Dimenſions of Bodies are adjuſted. Now becauſe this may be done by any known length divided into known parts, or repeated as need requires; it's no wonder if it were done ſometimes by a Rule divided into five hand-breadths, ſometimes by one of ſix, other times by one of eight hands breadth, as convenience might prompt. But the legal ſetled or ſacred Standard, moſt properly or peculiarly called *Ammah*, or *Cubitus Veriſſimus*, as the Vulgar Latin tranſlates it, in *Ezek.* 43. 13. this all agree to be of ſix Palms.

This proper Standard-Cubit only I took as the rule of other Meaſures; and I believe the Scripture always means this, when it uſeth *Ammah*

without any mark of distinction or limitation in the Context: for words of different significations being set alone, are to be understood in their most famous or noted sense; else there will be so much place for equivocation, that the use of all Speech and Writings, even of the Bible, will be destroy'd. And the Scripture marking out a distinction in a few places, shews it was carefully written; and that that distinction is not to be understood, where not express'd. *Non est distinguendum, ubi lex non distinguit. Exceptio firmat regulam in non exceptis.*

Particularly; I observe none intimating a difference of Cubits, but one in *Moses* his Books, *Deut.* 3. 11. where speaking of the Dimensions of the Bed of *Og*, a Foreigner from *Israel*, who therefore had no respect to the Jewish Standard, he saith, his Bed was measured by the Cubit of a Man, *i. e.* an ordinary Man, not like him; and a more precise Measure in this case was not at all needful. The other two places that intimate some difference of Cubits, are in *Ezek.* 40.

5. & 43.13. Now he writing while he was Captive in *Babylonia*, muſt be thought to have obſerved that Meaſure differing from the Jewiſh Standard, was there often uſed, even by the Jews alſo, who muſt uſe the Meaſures allowed in the Kingdom where they live; and therefore being to give them the Meaſures of the future Temple, he was obliged to intimate that the Cubits whereby they were expreſſed, were not ſuch as in this Foreign Kingdom they oft uſed, but longer by one hands breadth.

This being premiſed, I purſue my Argument, by ſhewing, that the Eaſtern People determined their Digit, and conſequently this hand-breadth, by the breadth of ſix Barly-Corns making a Digit, 24 a hand-breadth, as appears, not only by the Jews, but by the *Nubian*-Geography, *Ali Kuſhgi*, *Abulfeda*, *&c.* taking ordinary Barly; yet the better and plumper, rather than the worſe: *Optimum in ſuo genere menſura reliquorum.* Now ſix ſuch Grains (any Man's Eyes may ſatisfy him) will make above 9 Tenths of an Inch Engliſh; and

although there be ſome inconſtancy in different Grains, it may rationally be fix'd in order to a ſetling a Standard, at ,912 of an Inch, as a middle rate, which is ſometimes exceeded by Nature, but oftner ſhe falleth ſhort of it; that is, the Eaſtern Digit may be exactly ſtated at 9 Tenths of our Inch, 1 Centeſimal, 2 Milleſimal parts thereof.

Wherefore ſince there be 4 Digits in a Palm, it ſhall be by Multiplication of ,912 into 4, 3,648; that is, 3 Inches, 6 Tenths, *&c.* And the Digit ,912, multiplied by 24, produceth 21,888, which is juſt the *Cairo*-Cubit, as was to be demonſtrated.

Here obſerve, that this Handsbreadth, and Digit, agree well enough with middle-ſiz'd Men among us; and theſe may well be kept conſtant in this Sandard, as ſo agreeable, both to the nature of the Vegetable Barly, and the animated uſeful part of Man, which were before Standards, and theſe derived from them: whereas in Meaſures more lately conſtituted, as the Greek and Roman Cubit and Foot, it's

it's manifeſt that they make their different Palms, and Fingers-breadth, by firſt fixing the Cubit or Foot, then dividing the Foot into 12 parts, and calling them, though different in the ſeveral Notions, by the Names of Fingers and Palms, to which they are ſomewhat near, but with great uncertainty.

My firſt Argument bore upon Natures uſual bigneſs of Barly, compared with the agreed number of Fingers-breadths and Palms in the Jews Cubit, adjuſted with the Egyptian: My Second ſhall be from Divine Authority, of *Ezek.* 43. 13. parallel to 40. 5. deſcribing the Cubit the Altar ſhould be built by, to be a Cubit and a Hands-breadth. The moſt natural Expoſition of which place, I conceive to be this, that they ſhould determine the Altar's Meaſure by a Cubit, which ſhould contain one Handsbreadth more, than that Cubit which they now ordinarily ſaw and uſed in the Babylonians Country, where now they were Captives.

Hence

Hence I infer two things uſeful to my purpoſe.

1. That the Hands-breadth was a Meaſure fully known and agreed of in *Babylonia*, the ſame that in *Judæa*: For if they had differed in this, as they did in the uſual Cubit, it had been in vain for the Prophet to deſcribe the Sacred Cubit by an additional Hands-breadth, whoſe true quantity was as unknown to them, as the true quantity of the Sacred Cubit is intimated to be: he ought firſt to have ſtated a Sacred or true Jewiſh Hands-breadth; but he not doing ſo, and yet purpoſing to lead them to an exact Jewiſh Cubit, by theſe words implies the Hands-breadth uſed in *Babylon* and *Judæa* to be the ſame. Other Hands-breadths, as the Roman and Greek, differ conſiderably, as their Feet do.

2. Becauſe it's agreed that the Jewiſh Cubit was juſt ſix Hands-breadths, and affirmed here to be one more than the Babylonian; it follows that the Babylonian now uſed, was but of five Hands-breadths in length: wherefore in our Inch-meaſure, if we ſubſtract the Hands-

Hands-breadth 3,648, from 21,888 the Cubit, the Remainder is the Babylonian Cubit 18,240, which is not a quarter of an Inch longer than ours. And the addition of this Palm to 18,24, makes the Egyptian Cubit as before: Or rather thus, 6 multiplied into the Hands-breadth 3,648, produceth 21,888.

I am confirmed in belief of ſuch a Babylonian Cubit often uſed, as differed in number of Hands-breadths, but agreed in the quantity of every ſingle one, by theſe things;

1. By a Teſtimony out of the *Miſne Chilaim*, cap. 17. cited by *Arias Montanus*; that there were two Standard-Cubits kept in *Suſan*, which he referrs to, one of five Palms, the other of ſix. And Dr. *Caſtle* in his *Lexicon* in *Ammah*, proves from *Jophe Toar*, that there were even in the Sanctuary, Cubits (or Meaſures) of 5,6, and 10 Palms; which might all be of convenient uſe, for the meaſure of little and greater Lengths, if they agreed in the quantity of the Palms whereof they were made; becauſe all Sums of Length meaſured by them, might

might eaſily be divided by 6, and ſo reduced to the ſetled Standard of ſix Hands-breadths; but otherwiſe ſuch diverſity of Meaſures muſt breed infinite confuſion and uncertainty.

So we can find the number of our Yards in any length, as a Mile, although we meaſure it either with a two-foot Rule, that is ſhorter, or with a Pole of 16 Foot and an half, that's ſo much longer; but ſtill the Standard-foot muſt be ſuppoſed in both of them to be fixed; only we find it convenient, both for diſpatch and truth, in meaſuring greater Lengths, to uſe ſuch longer Meaſures, as have in them the ſhorter, often exactly repeated.

2. By a Teſtimony of *Abulfedas*, who in the Preface to his Deſcription of *Choraſmia*, informs us, that the Ancients uſed another Cubit, conſiſting of 32 Digits (that is, eight Palms) beſides that of 24 Digits, or 6 Palms: yet this made no real difference in their Meaſures, becauſe they all agreed in the Quantity of the Digits, and in the Sum of them, and conſequently in the Quantity and Sum of the Palms.

3. By

3. By a paſſage in *Herodotus*, (who flouriſh'd not much above 100 Years after *Ezekiel)* in his *Clio*, deſcribing the height of the Wall of *Babylon* to be 200 Cubits, adds for greater exactneſs, that they were Royal Cubits, which are three Fingers-breath longer than the μέτριος πηχυς, moderate-ſiz'd Cubit.

Hereby he ſeems to intimate theſe two things to my purpoſe.

1. That the Babylonians had, and might moſt obviouſly have been conceived by his Reader, to have uſed a middle-ſized Cubit, meaning, one like the Greek Cubit; for to ſuch Readers uſe he wrote: but he informs them, that in determining the Wall's Height, they uſed a longer, called the *Royal Cubit*.

2. He informs us, that that Royal Cubit, was 3 Fingers-breadth longer than the other. Here by *Herodotus* his Fingers-breadth, I think we muſt underſtand, Greek Inches, which they called δάκτυλοι, becauſe he wrote for the uſe of the Greeks, who muſt not be ſuppoſed generally to underſtand the Babylonian Fingers-breadth.

This

This ſenſe of *Herodotus* being admitted, we have here intimated all that I deſigned in this Argument to prove; *viz.* That the *Babylonians* had two Cubits; one of a cize near agreeing with the Greeks, which differs very little from our Engliſh Cubit; and which being ſhorter, might be oftner uſed: another, a Hands-breadth longer: for three Greek Inches are ſomewhat more than three of ours, and the Eaſtern Hands-breadth we have ſhewed to be but three of our Inches with a Fraction annex'd, which was too nice a Matter for the Hiſtorian to take notice of.

And agreeably hereto I find, that *Almamon* the Learned *Calif* of *Babylon*, about 900 Years ago, did make uſe of ſuch a Royal Cubit, conſiſting of ſix Palms, in the meaſuring of a Degree of a great Circle of the Earth on the Plain *Sinaar*.

The Iſſue of theſe Obſervations, in relation to the Text of *Ezekiel*, is this; that whereas there was a leſs Cubit of five Palms, often uſed in *Babylonia*, the Prophet informs them, that they ſhould not determine the Altar's

Altar's Meaſure by his numbers of Cubits in that ſhort one; but in the larger Cubit, called the *Great Cubit*, *Ezek.* 41. 8. which had a Palm added thereunto; and was the fitter, as agreeing with both the ancient Meaſure of the Sacred Buildings; and alſo with the Royal Standard of the Prince under whom now they were. Which Royal Cubit, I ſuppoſe to have been kept there from the Ages neareſt to *Noah*; as the Egyptian, with which it agrees, we have ſuggeſted to have been ſetled by *Mizraim*, and derived from *Noah*.

In paſſing through this Argument, we have obſerved a near agreement between the *Babylonian* leſſer Cubit of five Palms, and the Greek Cubit, which *Herodotus* ſuppoſeth known by his Readers. I will now expreſs it preciſely, that of *Babylon* in our Inch-meaſure, I ſaid, was 18,24; that of the old Greeks was, 18,13; the difference is not a Barly-corns breadth. And our Cubit is no more leſs than the Greeks.

This makes me conjecture, that the firſt Planters of *Greece* coming from *Aſia*,

Asia, brought thence that Measure: a little neglect, in process of time, might easily make those small Alterations. Agreeably hereunto I find in these Western and Northern Parts, very near approaches to the Eastern Cubit of six Palms: for such is the Ell at *Frankford* on the *Main*, at *Florence*, and at *Dantzick*; and such is the Standard Foot at *Riga*; as may be seen in the Table of Foreign Measures, given us by Sir *Samuel Moreland*.

Third Proof taken from the Measure of the outward Wall of the Temple, which is given by *Josephus* and the *Talmudists*, in very different Measure; whereof *Josephus* his Measure seems to be the Jewish *Stadium*, or Furlong, composed of 400 Jewish Cubits; and the *Talmudist*'s Measure is 500 Roman Cubits; which they may reasonably be presumed to measure by; because when they wrote, the Jewish *Polity* had been dissolved some Centuries of Years; but the Roman Monarchy, and consequently the knowledg of their Measures, flourished. By comparing these, *Jacobus Capellus* hath stated the Jewish Cubit

to

to be to the Roman, as five is to four; which is the only way to reconcile *Joſephus* with the *Talmudiſts*, in a Matter wherein they may both be preſumed to have been good Witneſſes, ſufficiently skilful, careful and faithful. For proof of this Propoſition of Jewiſh and Roman Cubits, *Jacobus Capell. de Menſ. &c.* may be conſulted. An Epitome of his Argument is delivered by his Kinſman *Ludovicus Capellus*, in his Diſcourſes about the Temple, printed in our *Polyglot. Pag.* 23. *Col.* 1. about the middle.

That which I have to ſupperadd to him, is;

1. To reduce the Roman, and thence his Jewiſh Cubit, to our Engliſh Inch-meaſure.

2. To ſhew that his Jewiſh Cubit, ſo found, comes within a Barly-corns breadth of the Egyptian Standard; which yet I ſuppoſe he knew nothing of, but which is my main Concern to prove. Theſe I ſhall ſoon diſpatch together.

For Reduction, obſerve, that the Roman Foot, on the Monument of *Coſſutius*, now by moſt thought the

 trueſt,

trueſt, in Engliſh Inches and Decimals thereof, is 11,604; to which if we add half thereof, we have the Roman Cubit in our Inches, 17,406. Then by *Capellus* his Proportion, as 4 is to 5, ſo is the Roman Cubit 17,406, to the Jewiſh 21,757. Thus his Argument, from the meaſure of the Temple's outward Wall, finds ſuch a Jewiſh Cubit; as wants little above one tenth part of an Inch of the *Cairo* Cubit. And it's no wonder, if in ſuch a length as a Furlong, ſuch a little quantity be miſt (from the Cubit) which is leſs than a Barly-corns breadth: therefore I may even hence conclude, that theſe Cubits agreed.

Nevertheleſs I will ſuggeſt, that there is another Roman Foot a little different from the forementioned, that on the Monument of *Statilius*, which in our Inches is 11,664: if this be rather choſen, (as it hath ſome great Approvers) the Roman Cubit will be 17,496; and by the former proportion, the Jewiſh will be 21,87; which is nearer our aim, the Difference being only one Centeſimal part of an Inch. But the former Approach ſatisfies me.

The

The fourth Argument ſhall be from the conſent of ſome Learned of the Eaſt, if not to the Word, or particular Standard that I point at, yet to a Meaſure agreeing therewith, which is the thing I ſeek. Here I ſhall firſt mention *Abulfeda*, whom *Kircher* in his *Oedipus* cites, expreſly affirming, that the Jew's legal Cubit, was equal to the Egyptian Cubit of 24 Digits, which he calls their leſs Cubit, in compariſon with a longer Meaſure ſometime uſed by the Egyptians, conſiſting of 32 Digits, or eight Palms. Now *Abulfeda* being King of *Hamath*, a City and Territory very near *Judea*, and not far from *Egypt*, and exceeding curious and diligent in the Doctrine of Meaſures in the Eaſt, I conſide very much in his Teſtimony, agreeing with ſuch Reaſon as I have before produced. But *Kircher* appears not to have known the Egyptian Standard, and therefore could not improve this Teſtimony of *Abulfeda*, to the determining of Scripture-Meaſures; and *Abulfeda* being a Mahumedan Prince, although not unacquainted

with the Bible, yet took no care to explain the peculiar Measures thereof, which is my Business.

Another Testimony I shall offer from a Learned Jew, Rabbi *Gedaliah*, who deduceth his Assertions from the Doctrine of *Maimonides*, who so throughly understood the *Talmudists*, that his Judgment may well represent the sense of all the Jews. But I take it rather from *Gedaliah* than the rest; because he, under the conduct of *Maimonides*, and other Jews, hath adjusted their Notion of their Cubit to a known Standard among us, *viz.* to the Standard of the Cubit or Ell of *Bononia*, where he resided. This Testimony of his may be seen cited at large, and translated by *Hottinger*, in the Preface to his Tract, *de Cippis Hebraicis*: And the *Bononian* Ell is given us reduced to English Inch-measure, by my Honoured Friend Sir *Samuel Moreland*, and by Sir *Jonas More*, to be 25,76 Inches and Decimals.

Now, *Gedaliah* affirms two things in his Adjustment:

1. That 14 Jewish Digits are equal to half the *Bononian* Cubit: Whence

I

I infer, that 28 ſuch Digits are equal to the whole *Bononian* Cubit; and conſequently that the *Bononian* Cubit, 25,76, being divided by 28, the Quote will be a Jewiſh Digit. This Quote is in Decimals of our Inch ,92, a little bigger than the Jewiſh Digit by me formerly aſſigned, *viz.* ,912; and therefore 24 ſuch Digits will give a Jewiſh Cubit ſomewhat longer than mine, *viz.* his will be 22,08, which exceeds mine a little above the breadth of a Barly-corn, *viz.* 2 Tenths of an Inch.

But then in the ſecond place he affirms, that the Jewiſh Cubit is equal to $\frac{7}{8}$ of the *Bononian*, wanting one Digit.

To examine this, and to compare it with his former Aſſertion, I found it neceſſary to divide the *Bononian* by 8:8)25,76(3,22; and this Quote ſo found, muſt be multiplied by 7, the Product is 22,54. Hence ſubſtract 1 Digit (by his Account) ,92; the Remainder is affirmed by him to be the Jews Cubit 21,62. Now, this is leſs than his former Account by ,46, very near half an Inch; and is alſo

leſs than the Cubit I aſſign 21,88, by above a quarter of an Inch, *viz.* by ,26.

Thus it's plain that my Length aſſigned to their Cubit, lies between his two Miſtakes, which contradict each other; Nevertheleſs, I think he hath done us very good Service by the approaches to Truth, which are in both his Miſtakes: and I ſee reaſon to believe, that in both theſe Attempts to expreſs the Jewiſh by proportion to the *Bononion*-Cubit, he ſlipt only, through want of skill or accuracy in the Doctrine of Fractions, which if he had underſtood, he might have made his Accounts to agree better. However, the worſt of his Accounts differs but a quarter of an Inch from me, and his other is nearer agreement; ſo that he differs more from himſelf than from me, or is nearer agreement with me than with himſelf. And by his ſo near approach to me on each ſide, he confirms me in my Opinion, that I have aſſigned a Standard ſufficiently agreeing with the Doctrine of the Jews concerning their own Nation's ancient Cubit, which

which is all I undertook in this Argument.

After I had finiſh'd this Diſcourſe, it was ſuggeſted to me, by a Learned Friend, that Rabbi *Gedaliah*'s words, wherein he affirms the Jewiſh Cubit equal to $\frac{7}{8}$ of the *Bononian* Cubit, wanting one Digit, are capable of another ſenſe than that wherein I took them, *viz.* he may mean, That a Digit---,92 Decimals of our Inch, being taken out of the *Bononian* Cubit ---25,76: the Remainder, which is 24,84, muſt be conſidered, and $\frac{7}{8}$ of that will be the Jewiſh Cubit. Wherefore divide 24,84 by 8, it quotes 3,105: multiply this Quote by 7, the Product will be 21,735 for the Jewiſh Cubit, which differs from mine not much above 1 Tenth of an Inch; and therefore ſtill the more confirms mine Aſſertion, and brings him nearer to agreement with himſelf, which makes his Teſtimony the more valuable.

My laſt Argument for this Cubit, ſhould be taken from its greater fitneſs to all the uſes, to which a Cubit-meaſure is aſſigned in the Scripture. As

to give more convenient grandeur to the Tabernacle, to the Temple, and to thoſe other ſacred Things that belonged to God's Service in them both. But all theſe things will require larger Diſcourſe than can be allowed in this Work. Wherefore I ſhall only inſtance in two things.

1. In the Height of the Table of Shew-bread, becauſe the account of that will be very ſhort, and yet ſeems clearly to favour this Meaſure which I have propoſed. *Moſes* expreſſeth its Height to be one Cubit and an half, *Exod.* 25. 23. This, in my Account, ariſeth to above 32 Inches and three quarters, *viz.* in Decimals 32,83, which is a convenient height for a Table. But if we take a ſhorter Cubit, ſuppoſe the old Roman Cubit, its height will be, in Engliſh Meaſure, but two Foot and two Inches above the Floor, which ſeems very inconvenient for a Table.

2. In the Capacity of *Noah*'s Ark, of which becauſe the moſt Learned Dr. *Wilkins* hath written very particularly, I will only add this general Remark; That if inſtead of a Cubit

of

of 18 Inches, our Cubit which is 21,888 be admitted, the Capacity of the Ark, built according to *Moſes* his Numbers of Cubits, will be very near twice as great, which will make it much more convenient for all the Ends to which it was deſigned. For ſuch an Ark made by this longer Cubit, will be to its like made by a ſhorter Cubit, as the Cubes of theſe different Cubits are to each other; but the Cube of my Cubit is very near double to the Cube of 18 Inches, therefore ſo will the Capacity be: The *Major* all Geometricians know to be true, and the *Minor* any Arithmetician may find; therefore the Concluſion is true.

Our third Propoſal, was hence to determine other Scripture and Eaſtern Meaſures of Length: Now this is eaſy, becauſe it's agreed of leſſer.

	Inches.
1. That the Span, or *Zereth*, was half a Cubit	10,944
A Palm, or Hands-breadth ⅓	3,648
A Digit, Fingers-breadth $\frac{1}{24}$	,912

So

So also, 2. of their biger Measures, ὀργυία, a Fathom, 4 Cubits, *Ezekiel's* Reed 6; *Canna*, or a Pole, was 8 such Cubits, in English Feet 14,592.

Schenus, or their Line or Chain, 80 Cubits	145.92
Iter Sabbaticum, Sabbaths Journey, 2000 Cubits	3648
Their Mile, its name from Romans 4000 Cubits,	7296 — *Mil. Eng.* 3816
Their *Parasang* 12000 Cub.	21888 — 4,1454
The 30th part thereof is a *Stadium*, as *Herod.* and *Hesychius* witness	400 Cubits.
Their days Journey not always equal, but at a middle rate, set by *Abulfeda*, is 8 *Parasangs*	Cubits. 96000 - 33,1632

It will not be necessary for me to give the Proofs of the Proportion of these Measures to the Cubit, or to each other: this is generally agre'd on, and the common Writers on this Subject have produced them: Wherefore I have thought my self only obliged to reduce them to our

our Standard-meaſure, ſuppoſing the Cubit to have been already rightly ſtated. And the like Method I have uſed about the Meaſures of Capacity, deduced from known Proportions to the *Epha*, and the other Weights deduced from *Shekel*.

I ſhall only add this Obſervation, That becauſe ſo many Meaſures were determined by relation to the Cubit, the Egyptians and Jews were obliged to be conſtant in the Standard thereof, elſe the proportion to all their other Meaſures would be altered, and the ancient Meaſures of all their Lands, and beſt Buildings, would be greatly diſturbed: as we might ſhew by inſtancing in the Levites Suburbs, ſet out by 1000 Cubits on each ſide of their Cities, and the Egyptian ἄρουρα, mentioned by *Herodotus*, which were determined by 100 Cubits on every ſide.

CHAP.

CHAP. III.

Of the Epha, *and other Measures of Capacity thereby determined.*

MY next endeavour shall be, to find the true Capacity or Content of the Jewish *Epha*; which I think will be most exactly expres'd, both by the number of solid Inches (English) of Water, which is contained, and by the number of Gallons and Pints, or known parts thereof, taken in Measures agreeing with our Standards. But both these must be found by help of the ancient Roman Standards yet remaining, to which both the Greek and Jewish Measures have been reduced by the Ancients.

For the clearing of my way of expressing the Capacity of this Measure, I must premise two things.

I. That the most exact and Geometrical way of expressing the Capacity

ty of any Veſſel, or Meaſure, is by expreſſing, in known terms, the ſolidity of a Body which will preciſely fill it; the fitteſt will be Water, ſuch as drops from the Clouds, which we ſuppoſe not to differ ſo conſiderably in the ſeveral Regions of the World, as Spring-waters do. Now, the Solidity of all Bodies is beſt expreſs'd by help of a Cube, whoſe equal ſides and height we know by a Standard-Meaſure of length; ſuch is a cubic or ſolid Inch, whoſe ſide is the twelfth part of a Foot, and a Foot the third part of the Iron Yard, kept at *Guild-hall* for the Standard of *England*.

And it appears, that this way of determining Meaſures of Capacity, is not only moſt Geometrical, but alſo exceeding Ancient; becauſe the Egyptians made their *Ardob* to be the Cube of their known Standard, the Cubit; and the old Romans made their Quadrantal, the Cube of their Standard, the Foot, as both *Feſtus*, and the ancient Verſes of *Rhemnius Fannius* witneſs; which I need not tranſcribe, being obvious in divers Writers; my deſign being only to ſhew, that the

An-

Ancients aimed at this Correſpendence between Meaſures of Length, and thoſe of Capacity.

And indeed, a Cube is the only regular Solid which I have obſerved to be deſcribed in the Scripture, by all its Dimenſions of Length, Breadth, and Heighth; and there ſuch cubical Dimenſions are aſſigned (what ever is the Myſtery of it) to the moſt Sacred Type, the Holy of Holies, 1 *Kings* 6. 20. and to the moſt holy Antitype, the *New Jeruſalem*, *Rev.* 21. 16.

Perhaps (becauſe the ſimpleſt Soild hath all poſſible Dimenſions in it) it may intimate;

1. The ſolid or compleat felicity of the Heavenly State, reſpecting the Length, Breadth, and Height of Divine Love, *Eph.* 3. 18. which is the Fountain thereof.

2. The perfect reſt and conſtancy thereof, becauſe the *Hedra*, or Reſting Baſes of the Cube, are ſix, which *Euclid* hath ſhewed to be a perfect Number: and they are all Squares, whence the Cube is leſs ſubject to be ſhaken, than the other regular Bodies.

Some-

Something to this purpoſe is intimated in the old Maxim, Ἀνὴρ ἀχαλὸς τέλειος.

II. I premiſe, that amongſt us Engliſh, it is agreed, that our Wine-Gallon, now moſt frequently uſed, contains preciſely 231 Solid or Cubical Inches of our Standard-Meaſure; and our Corn-Gallon, which is the Statute-meaſure of Capcity in *England*, contains 272 ſuch Inches: for although Mr. *Oughtred* affirm it to contain $\frac{1}{4}$ of a ſolid Inch more (which is very little difference) divers others ſince, upon exact tryal, ſee no cauſe to add that Fraction to its Capacity.

For theſe Reaſons, and to ſhew the dependance of the *Epha* on the Cubit already ſtated, I ſhall expreſs my opinion concerning the Content of *Epha*, *&c.* in a number of our ſolid Inches, and in Decimal Fractions thereof, rather than any other ſort of Fractions, which are more troubleſome or difficult to be underſtood and reduced.

I conceive that *Epha* was about 1747 ſolid Inches of Engliſh Meaſure, not much diſtant from the Engliſh Foot

Foot Solid, which is 1728; and is near the Inches Solid of 1000 Ounces of Water. Or in Wine Measure it was 7 Gallons, 2 Quarts, and about half a Pint. In Corn Measure, 6 Gallons 3 Pints, and 3 Solid Inches.

This Capacity of *Epha*, or at least for approach thereunto, I shall endeavour to prove by four Arguments.

1. From its proportion to the Cube of the Cubit of *Israel*, formerly stated.

2. From its proportion to the *Corus*, or *Chomer*.

3. From its proportion to the *Seah*.

4. From the agreement of this Capacity with the content or solidity of 432 Eggs, whereby the Rabbins ordinarily determine it.

But I confide more in the two former Arguments, because taken from bigger Measures, than in the two latter, which arise from less. And therefore have altogether omitted the investigation from Number and Weight of Grains of Wheat, which I find elsewhere used: because every little

little Errour (which is unavoidable in ſmall Meaſures) grows greater in the progreſs by multiplication; whereas little Errours in bigger Meaſures, when we paſs from them to leſſer by diviſion, grow ſtill leſs than the former, which tends to exactneſs.

Arg. 1. *Epha* is the ſixth part of the Cube of the Egyptian Cubit, which Cube is called an *Ardub*: but the ſixth part of that Cube, or an *Ardub*, is 1747,7 ſolid Inches: therefore ſo is *Epha*. The proof of the Major is from the expreſs affirmation of the Arabian Accountants and Mathematicians, *Alſephadi* and *Ebn. Chalecan*, printed in Dr. *Wallis* his Arithmetic; *cap.* 31, and received from Dr. *Pocock*. Only there the *Epha* is by an uſual commutation of the quieſcent Letters, and of the Labial *p* into *b*, called *Oeba*, or as Dr. *Wallis* expreſſeth it, *Waibah*. But *Salmaſius*, and Dr. *Caſtle*, and all the Learned in the Eaſtern Languages, that I have met with, acknowledg that *Arabic* Word to expreſs the ſame Meaſure, that the Jews call *Epha*. And the matter

ſeems clear, by comparing the Hebrew *Exod.* 16. 36. with the Arabic Tranſlation, in which *Waibah* is put to expreſs the Hebrew *Epha.*

Add hereunto, that it may be deduced from what *Golius* affirms, treating of *Corus* as a Babyloniſh Meaſure; that at *Babylon* alſo the *Ardub* was equal to ſix *Ephas:* for he aſſerts 40 *Ardubs*, equal to 720 *Seahs*, which are known equal to 240 *Ephas.* Wherefore divide the number of *Ephas* by the number of *Ardubs*, the Quote will be 6; which ſhews that one *Arduh* is equal to ſix *Ephas.*

Thus this Proportion appears acknowledged wide in the Eaſt; although I do acknowledg that ſeveral *Ardubs* of different Capacity from this are mentioned by *Kircher*, as uſed among the Egyptians; and other ἄρταβαι, ſtated by the Greeks. Yet this ſenſe of the word being as fully atteſted, and this being determined by a ſure Standard, I ſhall conſider it only in this ſenſe, having no uſe of its other various ſignifications.

Thus the *Major* is proved by Authorities; the *Minor* is demonſtrable thus

thus. The Egyptian Cubit reduced to Englisſh Inches, hath been proved to be 21,888. This number multiplied by it ſelf, produceth its Square; that multiplied by the Side, or firſt Number, produceth the Cube, which is the Content of the *Ardub* in ſolid Inches.

Laſtly; This being divided by 6, the number of *Ephas* in *Ardub*, the Quote is 1747,7. The Arithmetical Operations need not be ſet down at large in this Paper, but may be tried by any Arithmetician at his leiſure.

But becauſe it is not eaſily credible that the Ancients, in making their *Ardub*, did conſider the thouſandth, or the hundredth part of an Inch (which yet I have expreſſed by Reduction from *Greaves* his Meaſure of the Egyptian Standard, that I might not willingly depart from his exactneſs) and becauſe the Abatement of the Centeſimals of an Inch, in the ſide of the Cube, will err leſs from preciſeneſs, than the addition of a like quantity, and will reduce the *Epha* to a Meaſure ſo well known among us; I have expreſs'd it alſo by an Engliſh

Foot Solid; which will be found to come from the ſixth part of the Cube of 21,8; for the Cube thereof is 10360,232: and that divided by ſix Quotes 1726,7, differing leſs than two ſolid Inches from the Foot ſolid 1728.

From this approach to Agreement we may not only help our Memory, but alſo probably conjecture, that as our Foot is two thirds of our Cubit, ſo the Eaſtern People had a Meaſure which we may call their Foot, which alſo was two thirds of a Cubit, ſometimes uſed among them, *viz.* a Cubit of five Palms: Which differed not much from our Cubit, as I formerly ſhewed. And the Cube of that Foot of theirs, was probably the Original of this ancient Meaſure, the *Ephah*, which a little exceeds our Foot Solid; as alſo ſuch their Foot and Cubit, in length, a little exceeded ours.

However it's certain, that the exceſs of the Cubic-Root of an *Ephah* above our Engliſh Foot, is not quite five Centeſimals of an Inch, or not the twentieth part of an Inch.

I have alſo obſerved, that the *Epha*, or *Bath*, contains juſt 1000 Ounces *Averdupoiſe*, or 2000 Shekels weight of pure Rain-water; which being lighter than our Fountain-water, and of a more conſtant equality in its Weight than Spring-waters are (which differ a little in weight from each other) takes up a little more room than ſo many Ounces of our Water will do: ſo that though we reckon 1726 Cubic-Inches to 1000 Ounces of our Fountain-water, we may well allow about 1747 ſuch Inches to 1000 Ounces of their lighter Rain-water.

And it's evident that the Ancients determined their Veſſels of Capacity by weight of Water. So the Roman *Congius* held juſt 10 pounds of Water, and that of Rain, as *Dioſcorides* hath noted: their *Amphora* 80 ſuch Pounds, their *Sextary* 20 Ounces. And it's certain, that the reckoning of Weights by round Numbers of Shekels, or their double, which are Ounces, is moſt ancient. And univerſally, that moſt ancient expreſſion of *Job* 28. 25. *He weigheth the Waters by Meaſure*, intimates, that their ancient Meaſures

of Water were of a known weight, else it were impossible to weigh them by measure, or thereby to estimate and adjust their Weight. But this will be clear when we handle Shekel.

Here I thought fit to remark, that the concurrence of the Measure of this Solid Foot, and of the Weight of 1000 Ounces of Water, might recommend this Measure called *Epha*, or *Bath*, to the first Founders or Authors thereof; and this happy concurrence is the true cause, that all their Measures and Weights may be investigated and prov'd, both *à priore*, by beginning with the simplest Measure of Length, and thence proceeding till we end in the Weights; and *à posteriore*, or *per egressum*, by beginning with the weight of a Shekel, and passing through all the Measures of Capacity, until we come to the Cubit, their Root; as I shall shew in their Harmony at the end of this Discourse.

The Reduction of this Measure to our usual Measure by Gallons, *&c.* is thus performed: divide 1747.7 by 231, the Inches Solid in a Wine-Gallon, the

the Quote will be 7,566: which ſignifies ſeven Gallons, half a Gallon, or two Quarts, and about half a Pint. The like Method may be uſed for the Corn-Gallon. This may ſuffice for the firſt Argment, which may pretend to accuracy, becauſe its *Major* is the affirmation of Mathematicians, referring the *Ardab*, and its ſixth part, the *Epha*, to a known Standard, the Egyptian Cubit; and the *Minor* is certain by true Calculation. Thoſe that follow pretend not ſo high, yet are of good moment, becauſe they make ſome approach of agreement herewith; and many Witneſſes agreeing in the Main, do corroborate each others Teſtimony.

Arg. 2. Is taken from the *Chomer* or *Corus*, which all agree to be the ſame, and to contain 10 *Ephas*, and is made the Rule of *Epha*, by *Ezekiel* 45. 11. regulating prudently the leſs by the greater. Now *Joſephus*, *lib.* 15. *cap.* 11. ſaith expreſly, That ὁ κόρος δύναται μεδίμνους ἑβδομήκοντα δέκα: Wherefore he hereby intimates, that *Epha*, the tenth part of *Corus*, was

equal to the *Medimnus Atticus*. The Content hereof we muſt firſt find in Roman Meaſure, to which the ancient Greeks and Romans have reduced it; and then we muſt reduce the Roman Meaſure, by help of *Veſpaſian*'s Standard *Congius*, ſtill remaining at *Rome*, to our Engliſh Standards: and ſo we ſhall ſee how far *Joſephus* his Eſtimate of the *Epha*, agrees with, or differs from that which I have propoſed.

But I muſt premiſe, even to the firſt Reduction, that two things are agreed among the ancient Greek Writers:

1. That *Medimnus Atticus* was equal to 48 *Chœnices*. So ſay *Pollux*, *Aarpocration*, *Galen*, *&c.*

2. That one *Chœnix* was equal to three *Cotylæ*. So *Pollux* in two places, in words at length, not ſubject to ſo much corruption, through miſtake, as Characters are; and *Cleopatra*, and others.

Hence the firſt Reduction to Roman Meaſures is thus made; every *Cotyla* is equal to half the Roman *Sextarius*, and conſequently 12 *Cotylæ* to the

the Roman *Congius*. So *Galen*, and the Author of the *Hippiatric* Weights and Meaſures, *Dioſcorides*, and others, to be ſeen in the Treatiſes ſet at the beginning of *Stephanus* his Appendix to his *Theſaurus*. Herewith agrees what the ſame Authors and *Cleopatra* affirm, that 4 *Chænices* are equal to the *Congius*, or to 12 *Cotylæ*. Hence it follows, *Medimnus Atticus* being equal to 48 *Chænices*, muſt be equal to 12 *Congii Romani*; for 48 divided by 4, which is the number of *Chænices* in a *Congius*, quotes 12.

For the ſecond Reduction, whereby the Roman *Congius*, and the Greek *Medimnus*, *Chænix*, and *Cotyla*, may be brought into ſolid Inches of Engliſh Meaſure, and ſo compared with our Meaſures of Capacity, I offer this Expedient. It is agreed, and the Inſcription on the *Congius* of *Veſpaſian*, witneſſeth it, that Meaſure contained juſt 10 Roman Pounds of Water, or Wine. Each Roman Pound was 12 Roman Ounces; each Roman Ounce hath been found, by *Greaves* and others, to anſwer exactly to 438 Grains of our *Troy* Weight: Wherefore

fore it wants 42 Grains of our *Troy* Ounce. And juſt ſo many Grains as Dr. *Chamberlain* in the State of *England* affirms, doth our *Averdupoiſe* Ounce fall ſhort of the *Troy* Ounce, which is 480 Grains. Hence I conclude, that our *Averdupoiſe* Ounce, is the ſame Weight with the old Roman Ounce, which hath continued to be uſed, both in *Rome*, and here in *England* to this day, from the eldeſt Times. And we muſt conſider, that the name *Averdupoiſe*, which ſignifies Weighty, was not at firſt given to this Ounce, but to the Pound, conſiſting of ſixteen or eighteen ſuch Ounces; which therefore was much more weighty than the uſual Roman Pound, which had but twelve ſuch Ounces: which Pound is not uſed among us, although the Ounce, as part of a weightier Pound, be ſtill retain'd.

Sir *Jonas More* hath calculated a Table (founded in Experiments, concerning the Weight of any known Number of ſolid Inches of Water, made by Dr. *Wibberd* and others, whereby we may turn any given Ounces *Averdupoiſe* of Water, into ſolid Mea-

Meaſure, expreſſed in Inches and Decimals thereof; which becauſe it is ſhort and uſeful for my purpoſe, I will tranſcribe.

Ounces.	Inches Solid and Decimals.
1	1.72556
2	3.45112
3	5.17668
4	6.90224
5	8.62780
6	10.35336
7	12.07892
8	13.80448
9	15.53004

For an Example to ſhew the uſe of this Table; Let us take the 10 Pounds of Water that fill the Roman *Congius*; and becauſe each Pound is 12 Ounces *Averdupoiſe*, call them 120 Ounces; the higheſt Figure ſignifies 100 Ounces. Wherefore take out of the Table the Number anſwering 1; and becauſe of the two Cyphers which make it an hundred, remove the Separatrix two places further; thus writing 172.556. So alſo for the 20, remove the

the Separatrix one place thus, 34.511
207.067

This Sum gives the ſolid Inches of Water that fill the Capacity of *Congius Romanus*; and ſhew it to be leſs than our Wine-Gallon of 231 Inches, by almoſt 24 ſolid Inches. So *Cotyla* containing 10 Ounces of Water, is found in ſolid Inches, 17,25; and *Chænix* containing 30 Ounces, muſt be in ſolid Inches 51,76. So, laſtly, to determine the *Medimnus* by the ſolid Inches of Water that it contains, multiply the Content of *Congius* by 12, the Product is *Medimnus*,

207.06
12
41212
207c6
2484.72

The *Medimnus* thus found, when compared with our propoſed *Epha*, proves bigger than it by 737 Inches, or above three Gallons Wine-meaſure. This ſhews that although I have exceeded the common eſtimate of *Epha*, which makes it the Cube of the Roman

man Foot, on very weak grounds, yet I have not gone ſo far as *Joſephus*.

Nor can I recede from the Reaſon I have alledged for *Joſephus* his affirmation, but ſhall anſwer his Authority, by ſaying;

1. That I conceive he did not intend to aſſert a preciſe Mathematical Equality between *Epha* and *Medimnus*; but to expreſs the content of a Jewiſh Meaſure, as an Hiſtorian, ſomewhat near the truth, by comparing it to this moſt famous approaching Meaſure, known among the Greeks, in whoſe language he wrote.

2. That an *Epha* heaped up, will anſwer very well to a *Medimnus* not heaped: this ſeems a ſufficient conciliation, that he reſpected an *Epha* cumulated; my number reſpects only an *Epha* ſtrickled (as the Country-men ſpeak) which is moſt certain and conſtant; becauſe the Breadth or narrowneſs of the Meaſure, will alter the heaping very much.

To this head I ſhall adjoin another approach to *Epha*, by help of the Greek *Chœnix*, which is founded on a probable emendation of *Heſychius*, which

which I crave leave to propoſe, becauſe the place is certainly corrupted, and I have not met with any attempt to mend it. Thus it is now printed; οἱφὶ μέτρον Αἰγύπτιον πόσαρα χοίνικον. That it is an Egyptian Meaſure, is truly and judiciouſly affirmed; but that it contained but four *Chœnices*, is far from credible, for that would make it all one with the χοῦς, or *Congius*, which it far exceeded by the acknowledgment of all.

Therefore I have thought it probable, that *Heſychius* did write it, either in Characters thus, ΔΔΔΙΙΙΙ χοινικον, as *Herodian* informs us the Greeks anciently wrote 34, putting three δέλτα's for 30, becauſe each Δ ſtood for δέκα, or Ten, being the firſt Letter of that word, and each Ι for ſingle Units. And ſome Tranſcribers afterward being ignorant hereof, did take Δ to ſignify 4, as in later Times it doth, and the π's the ſame; and to avoid Tautology, wrote πόσαρα χοίνικον. Certain it is, that there ſhould be, and probably was, either a Word or Character ſignifying 30 (either ΔΔΔ or λ) placed before πόσαρα, to make it fit

to

to ſignify the number of χοινικες in an *Epha*; which word, or Character, is now loſt. And that no Number is ſo fit (as thirty) to be added, will appear by the coincidence of 34 *Chenices* with the former Calculation from the Cubit. Thus *Chanix*—51,7 multiplied into 34, produceth 1757,8, and this differs from my aſſertion but the third part of a Pint, which is as little as can be expected in ſo big a Meaſure.

However, I truſt not to this Emendation alone; but if a better can be offered, ſhall thankfully admit it: Wherefore I will offer another approach to the finding a *Corus*, and *Epha*, by help of a Roman Meaſure taken out of an ancient Anonymus Latin Author, cited by *Salmaſius*, in his Epiſtle to *Wæus*, called by him, *Auctor vetus adjectus Scriptoribus Rei Agrimenſoriæ*. He affirmeth, that *duo Cori Culleum reddunt*. Hence I would draw an Argument (which it appears not that the Authors from whom I take this Teſtimony, did think of) to determine an approach to the Capacity of *Epha*.

For

For if the Roman *Culæus* (as it's oftner written with ſingle *l*) be equal or near to two *Cori*, it muſt be ſo to 20 *Ephas*. Now the Capacity of *Culæus* is intimated, both by *Pliny*, *lib.* 14. *cap.* 4. and by *Columella*, *lib.* 3. *cap.* 3. to be twenty *Amphoreæ*, or Quadrantals, each of which is known from *Sextus Pompeius* his *Plebiſcitum Siliorum*, to contain 80 Roman Pounds of Water, or 8 *Congii*. So by this Argument the Roman *Amphora*, and Jewiſh *Epha*, will be made equal, or near each other; for Mathematical Exactneſs is not to be hoped for in ſuch Authors.

The Roman *Amphora* did contain 1656 ſolid Inches, and near half an Inch more; as appears by multiplying the Content of *Congius* 207.06 by 8. And this is indeed bigger than the Cube of the Roman Foot on *Coſſutius* his Monument, by above three Pints of our Wine-meaſure, as *Greaves* atteſts he experimented, *pag.* 35. of his Learned Treatiſe on the Roman Foot. But ſtill this 1656, is leſs than our Number 1747, deduced from the Egyptian Standard; and more below the

the Content of *Medimnus* 2484, which *Joſephus* thought near enough. Wherefore ſince our number falleth above the *Amphora*, which this Author muſt make equal to *Epha*, and below the *Medimnus*, which *Joſephus* points at, as equal thereto; I hope, that being in a mean, and keeping to a publick Standard, I may have determined more exactly than either of them. And both their Teſtimonies will agree to aſſert, that I am not very far from the Truth, each of them coming nearer to me, than they come to each other. This is the ſum of my ſecond Argument.

My third Argument ſhall be, an attempt to prove my determination of *Epha* to be true, from Evidence, that the beſt Determinations which the Ancients have given us of the Capacity of *Seah*, comes near to the third part of the meaſuring Number which I have aſſigned; this being agreed by all, that *Seah* was the third of *Epha*.

And here I ſhall firſt conſider, what *Suidas* affirms, referring to a Number

of Roman *Sextarii*, which we know by the Standard yet remaining: and then ſupply what is confeſtly deficient in him, by the elder Teſtimonies of *Joſephus*, *Epiphanius*, and *Hierom.*

Suidas, in Σάτον, which is the Hebrew *Seah*, altered after the Greek faſhion, affirms it to be the Roman *Modius*, filled ſo as to run over its brinks; and that it holds in Liquids 15 Sextaries, or 25 Pounds. The weight in Water annex'd, ſecures us he ſpeaks of the Roman, not the Attick Sextary. Now fifteen Roman Sextaries are equal to two *Congii* and an half; which in ſolid Inch-Meaſure of Water, 517,66, being 300 Ounces in Weight. But this is leſs than the third part of our *Epha*, that being 582: So there wants above a Quart of our Wine-Meaſure. And *Suidas* implicitly confeſſeth his Meaſure too little, by ſaying it muſt be ὑπερπληρωμένον, heaped up ſo as to run over. This Heap might eaſily ſupply the Quart wanting in the Account in Water, which will not be heaped, and which indeed is leſs than com-

commonly is allowed to the *Modius*, it being uſually reckoned ſixteen Sextaries, and that would bring the Capacity of *Seah* to agree with mine within a Pint.

However, to inform us that the *Modius* was leſs than *Seah*, *Epiphanius* tells us, that it was equal to *Modius*, and ⅓. And *Joſephus*, *lib.* 9. *c.* 2. and *Hierom*, on *Matth.* 13. 33. ſay, it was an Italian *Modius* and an half. I know that the *Modius* is a diſputed Meaſure; therefore to avoid that diſpute, I counted by Sextaries, which being ½ of *Congius*, are indiſputable. And if the leaſt Capacity of *Modius* be taken, yet 1 and an half will ſomewhat exceed the Capacity I have aſſigned. Therefore the *Seah* which my Number requires, falls between a confeſt Defect in *Suidas*, and an Exceſs in *Hierom* and *Joſephus*, yet not far from either of them, and therefore is probable, being nearer to both Extreams in thoſe Authors, than they are to each other.

My fourth Argument is from the agreement of this number of ſolid Inches, with the content of 432 Hens Eggs, whereby the Jewiſh Doctors frequently determine the Capacity of *Epha*; as may be ſeen in *Buxtorf*'s *Lexicon*, in קב in *Arias Montanus*, *Tubal-Cain*, *&c.* Now if we divide my Number 1747, by 432, it will quote 4,04: which ſhews, that little above four ſolid Inches muſt be in an Egg, that 432 of them may make this quantity. And Experience atteſts, that the larger ſort of Hen Eggs, which yet are common, will contain four ſolid Inches of Water, or two Ounces and a third: and Meaſures when taken from Nature, are rather taken from the bigger Inſtances, than the leſs, as the Greek Foot from *Hercules* his Foot, and the Cubit from the Elbow to the Fingers end of a tall Man.

This experimental way I chuſe as more eaſy, than the Geometrical reduction of an Egg to a Sphæroid, or two *Conoides*, which few would underſtand.

derſtand. I might alſo ſhew, that as ſome, both Jews and Chriſtians, have aſſigned leſs Capacity to the meaſuring-Egg than I; ſo others, particularly *Capellus*, have given more: And that this Capacity may therefore be called a Mean Capacity, although it come near to the largeſt ſort of Hen Eggs; but it is ſufficient to have pointed at theſe things.

The Fruits of this long, becauſe difficult inveſtigation of the *Epha*, will be gathered in the eaſy determination of the other Meaſures of Capacity, whoſe Proportions thereunto are generally agreed on. For beſides a Bath, which is equal to it, it will follow, that

	Sol. Inches.	Wine Gal.	P.	Inch.
Corus, or *Chomer*, *viz.* 10 *Epha*'s	17477	75	5	7
Seah the third of *Epha*	582,5	2	4	3
Hin the ſixth	291,25	1	2	15
Homer the tenth	174,77	0	6	05
Cab the eighteenth	97,08	0	3	10
Log the ſeventy-ſecond	24,27	0	0	24,2

In

In this Reduction to our Meaſures, I have uſed the Wine-Gallon, becauſe more generally known and uſed among us; notwithſtanding the Corn-Gallon is the Statute-Meaſure. And becauſe the *Epha* and *Homer* after this Reduction fall out to anſwer very near known Meaſures; *Homer* to three Quarts; *Epha* ſeven Gallons, a Pottle and half a Pint. Alſo in the *Corus* I have expreſs'd the laſt ſeven ſolid Inches, although in *Epha*, its tenth part. I often omit the ſeven Tenths of a ſolid Inch as inconſiderable, becauſe it grows conſiderable when it's multiplied by Ten.

To remove the Objection which lies open againſt theſe Meaſures, that thereby an *Homer* becomes too great a quantity of *Manna* to be allow'd, as it was by God to every Man, for his ſuſtenance in the Wilderneſs; let theſe things be conſidered.

1. That Divine Bounty is concerned to proportion to each Man, now travelling, ſo much, that he may rather leave ſomewhat, than lack.

2. That *Manna* being like Coriander-ſeed, of a globular figure, when it

was in the *Homer*, must necessarily leave many empty Spaces, between every three or four *Spheres*, which had no Food in them; and these Vacuities added together, may reasonably be estimated about a third part of the Vessel's Capacity. For the solidity of a Cube, many of which will fill up a space without any empty Interstices, is almost as big again, as a Sphere, whose Diameter is equal to the Cube's side: the Geometricians say, as 1 to ,523 ::

3. It being light food, must needs be inwardly porous, and of a spongy contexture of Parts.

4. It would probably waste somewhat in dressing by the Fire, as it melted and wasted when the Sun grew hot. By these Reasons the three Quarts at first measuring will be reduced to to about three Pints of an oily liquid substance, which will not be too much for a Traveller, that needs eat thrice a day.

The *Homer* being thus freed from an obvious Objection, before I leave it, I think fit not only to observe the Antiquity of the Numeration by Tens in these Measures, *Corus* holding 10 *Ephas*,

phas, *Epha* 10 *Homers*: but alſo to add, that I have obſerved, that the Athenian Meaſure, *Cotyla*, (which, as I have intimated, held 10 Ounces of Water, and ſo was half a Roman *Sextarius*) muſt needs therefore be the tenth part of an *Homer*, as I before ſhewed it to be the twelfth part of the Roman *Congius*. And we ſhall leſs wonder that *Athens* carried on this Subdecuple Proportion in one of their Meaſures; if we conſider that *Athens* was a Colony both from *Sais* in *Egypt*, and from the Phænicians, as the beſt Antiquaries and Geographers agree.

By help of this Obſervation, we may note, that this *Cotyla* is a common Meaſure, to moſt (if not all) the Meaſures of Capacity, uſed among the Jews, with other Eaſtern People, and theſe Weſtern famous Nations, the Greeks and Romans: and ſo may ſerve to ſhew the Harmony between them, and their Reduction to ſuch an ancient Standard as the *Congius* of *Veſpaſian*, which is yet kept at *Rome*; and may ſuggeſt a probability that the common Original of them (as alſo the riſe of Man-

Mankind, and of the moſt neceſſary Learning) was from the Eaſt. Ten *Cotylas* make an *Homer*, hence the Jewiſh Meaſures may all be determined: two of them made a Sextary; hence the *Congius*, and other Roman Meaſures, three of them made a *Chœnix*; hence the *Medimnus*, and other Greek Meaſures. The word alſo is received at *Rome*, as well as at *Athens*; and I find, by Dr. *Caſtle's Lexicon*, that it's uſed by the Syriac and Arabic Writers of the Eaſt, although not found in the Hebrew Bible, wherein I meet not with any leſs meaſure than the *Log*. However, becauſe its Root, and other words akin to it, are found in the Hebrew, and other Eaſtern Languages, but no Root nor Kindred in the Weſtern: I rather believe that its Original was in the Eaſt, and the Greeks received it thence, than that the Eaſtern Nations received it from the Greeks.

By this Analogy between Eaſtern and Greek Meaſures, I am induced here to mention the *Metretes*, which St. *John* mentions, *chap.* 2. 6. which we tranſlate a Firkin, which is eight or nine

nine Gallons Ale-meaſure: at which rate the Water which Chriſt made Wine, will riſe to about 100 Gallons; which may well ſeem too much for our Saviour, the great Teacher and Pattern of Temperance, miraculouſly to provide for the Gueſts at a Wedding, after they had well drank before.

To remove this Difficulty, our Criticks have ſaid many things, which I need not repeat. But I will add one Notion about this *Metretes*, which I have not found amongſt our Commentators, which if it be admitted, will altogether prevent the Objection. I find in *Cleopatra*'s Diſcourſe about Weights and Meaſures, which with others of that Subject, is in the Appendix to *Steven*'s *Theſaurus*, that *Metretes*, among the Syrians, conſiſts of ſix *Sextaries*. Now it's known that the Greeks and Romans too, did often ſo extend the Name of *Syrians*, as to comprehend the Jews, eſpecially thoſe of *Galilee*, that juſt toucht *Syria*, ſtrictly called.

Wherefore I conceive St. *John*, ſpeaking of this Miracle done in *Galilee* on

on the *Syrian* Coaſt, calls that μέτρητης, which the Syrians called ſo, and that is the Roman *Congius*, conſiſting of ſix Sextaries. Now I have ſhewed already, that this is near a Pint leſs than our Wine Gallon. And ſo the Miracle will produce about ten Gallons and an half of our Engliſh Meaſure; which if the Gueſts were of any conſiderable number, might eaſily be drank without danger of Intemperance, eſpecially ſince Marriage-Entertainments did uſe to laſt for many days, *Judges* 14. 12.

I ſhall conclude this Diſcourſe with the conſideration of *Solomon*'s Brazen Sea, that capacious Veſſel for Water required in the Temple-Service. Its Height is five Cubits; its Diameter, called Breadth, ten; its Figure affirmed to be round: but it's not determined in the Scripture, whether this round Figure were an Hemiſphere or a Cylinder, equally wide at the bottom and the top, or a decurted Cone that was wider at the bottom than the top, where its wideneſs is expreſſed; or whether ſome other irregular

regular Figure of a protuberant Belly. Yet it's ordinarily repreſented to us in Cuts as an Hemiſphere.

But the main Difficulty ariſeth from the Capacity of it, which in 1 *Kings* 7. 26. is expreſſed 2000 Baths; and yet in 2 *Chron.* 4. 5. it is affirmed to hold 3000 Baths. The Hebrew Copies, and the ancienteſt Tranſlations, conſtantly delivering this different Account; it's not prudent to affirm either place to have been corrupted by Error of Tranſcribers.

Therefore I think *Grotius* hath well ſuggeſted, that in the firſt place ordinarily, when it was not filled up, it had 2000 Baths of Water in it; but, ſecondly, upon extardinary Occaſions, when more was requiſite, as at the great Feſtivals, it could, and did hold that greater number of Baths. This anſwer gives a good general Reaſon of a different Content aſcribed to this Veſſel.

But when we come to expreſs the Cubits of its Dimenſions in determinate Numbers of Inches, and after Multiplications ſuited to the Figure, divide the Product by the ſolid Inches of

of the Bath, or *Epha*, we ſhall find Difficulties to ariſe, which this Anſwer will not remove.

For inſtance; Let us ſuppoſe the Figure of this Sea to be Cylindrical, becauſe I ſhall ſoon ſhew this to be more likely than that of an Hemiſphere. The Diameter of the Baſe of this Cylinder being ten Cubits, muſt, according to our determination of the Cubit, be in Inch-meaſure 218,88; and its Height five Cubits, is in Inches 109,44. To find the Solidity or Content of this Cylinder, we muſt, firſt, find the *Area* of its Baſe, by this Analogy taught by *Archimedes*. As 14 is to 11; ſo is the Square of its Diameter, *viz.* 47908,4544, to the *Area* of its Baſe 37642,1357. Then we muſt multiply the *Area* by the Height; the Product of which Multiplication is the Cylinder's Content, *viz.* 4119579,44. Laſtly, This divided by the ſolid Inches of *Epha*, 1747, will quote 2358,08; the number of *Ephas* contained in that Cylinder. Hence it appears, that it will contain above 2000 *Ephas*, or Baths, which is the Number expreſſed in the

the *Kings*; yet not 3000 as the *Chronicles* ſaith, but there want 642 Baths almoſt.

Hence we may learn, that ſince a Cylinder of theſe Dimenſions is ſomewhat too little to hold the 3000 Baths; therefore an Hemiſphere, which is commonly offered to us of ſuch Height and Diameter, will be much more too little. For *Archimedes* aſſures us, that it is but two thirds of ſuch a Cylinder, and therefore will hold but two thirds of its number of *Ephas*, *viz.* 1572, and ſo will want 428 Baths of the 2000, or leſſer Number.

Wherefore we muſt conclude, that either our Cubits, and *Ephas*, one or both, are too big; or that this Figure is to be rejected as too little. But becauſe we have given much proof of the truth of our Cubit and *Epha*, and no Proof is given of this Hemiſpherical Figure, let that rather be rejected: but becauſe our Cylinder doth not only anſwer the leſs number of Baths, but gives us above a third part of the ſuperadded thouſand, which is in the *Chronicles*, I dare not reject it. For I acknowledg that it's poſſible, that

that the Author of the *Chronicles* adding 1000 to thoſe in the *Kings*, might only by that round Number intimate, that it held many hundreds of Baths, upon extraordinary Occaſions, above thoſe 2000 which the Author of the *Kings* had expreſſed, as ordinarily contained in it.

And indeed it's certain, that he doth not in this matter of the Sea, ſpeak according to Geometrical accurateneſs: for when he had ſaid that 10 Cubits were its Breadth or Diameter; he adds, that 30 Cubits would compaſs it round: whereas Geometry aſſures us, that above 31 Cubits are requiſite to make the *Perimeter* to a Diameter of 10. And yet it's ordinarily allow'd in Diſcourſe, that pretends not to Mathematical Rigour, to ſay, that thrice the Diameter is the Circumference; ſo may this Sacred Hiſtorian ſay, in a round Number, that the Sea held 3000 Baths, when in ſtrictneſs its Content was not quite ſo much, but yet conſiderably above 2000.

Thoſe that are not ſatisfied herewith, may ſafely aſſert, that this Sea was

was either so much wider at the Bottom, or so much swelled in the Belly, that it would contain 642 Baths more than the Cylindric Figure will yield; because there is nothing contrary hereunto in the History. And it will be more reasonable to adjust the Figure which the History determines not, to the Capacity which it doth express, than to reject the Measures asserted by so much proof, because they do not perfectly agree with a Figure which is pitch'd upon only by conjecture.

Since I came to this resolution of the Difficulty now before us, I have been confirmed in my Opinion, by reading in Dr. *Lightfoot*'s prospect of the Temple, *Cap.* 27. *Sect.* 3. that both the *Talmudists*, and the *Rabbins*, have acknowledged that 3000 Baths cannot be contained within the Dimensions of ten Cubits wideness, and five height assigned by Scripture, unless the Figure of this Molten Sea be affirmed to be wider than that of a Cylinder below the Brims. Thus far their Assertion agrees with my Accounts, and assures me, that their Notions, both of the Cubit's Length, and

of the *Ephas* Capacity, were not greatly different from mine, becauſe they own with me, that this number of *Ephas* is indeed ſomewhat too great for the Capacity of a Cylinder, the Diameter of whoſe Baſe is ten, and its Height five Cubits; but that what's wanting in this Figure, may be well ſupplied, by widening it towards the bottom, which I alſo have owned; We differ only in the manner of widening it ſufficiently below the Brim. For the *Talmudiſts* aſſign this way, That it was made ſquare at the bottom, each ſide ten Cubits, and roſe in this Figure of a *Parallellipedon* (as the Geometricians call it) up three Cubits high, but the other two Cubits of its height were a Cylinder, whoſe Baſe had ten Cubits in its Diameter. But ſurely they did only conjecture that this Figure would enlarge it ſufficiently, and never calculated its Capacity carefully. For upon a ſtrict calculation of the Content of this their compounded Figure, I find that it will be too little by above 250 Baths. And yet the Cubit which I have aſſigned and calculated by, is longer than

Dr.

Dr. *Lightfoot*'s Cubit, and therefore will make the Sea ſufficient to hold more than his: and the Bath I have aſſigned, is leſs than his, and therefore more of them will be contained within the given Dimenſions; and ſo both my Meaſures are fitted to remove the Difficulty; whereas by his Meaſures, bound to the *Talmudiſt*'s Figure, it's made inſuperable, and involves an impoſſibility. But adhering to my Meaſures, I find that a *Parallellipedon*, the ſide of whoſe Square at bottom is ten Cubits, and its Height full five Cubits, will contain 3001 Baths, and a little more: whence it's plain, that if two Cubits of its Height had been Cylindrical, it muſt needs hold leſs by a conſiderable quantity, the Angles being taken away, which held much. Yet becauſe in this *Parallellipedon* we have above a Bath more than we need, we may take off a little of the Corners near the top, and there make it Cylindric, that ſo it may both anſwer the Scripture's Hiſtorical Dimenſions of about thirty Cubits, compaſſing it round at the top, and in ſome Meaſure agree with

the *Talmudiſt*'s Tradition of a little Cylinder uppermoſt, though it muſt be much leſs in its Height than they affirm. For it's certain, by the Principles of Geometry and Arithmetick, that if 3000 Baths of the Meaſure which I have aſſigned, be comprehended in a Figure, compounded of Parallellipedon and Cylinder, whoſe Diameter is but ten Cubits, and their Height taken together but five.

That, firſt, the *Parallellipedon* muſt have its ſide in Inch-meaſure 218,88: The Square whereof we have ſhewn to be, 47908,4544; and the Height of it muſt be, in Inch-meaſure, 109,24, which is five Cubits wanting leſs than a quarter of an Inch. So the Content of this part of the Molten Sea, will be 5233519,558.

Then, ſecondly; the Cylinder's Baſe having its Diameter 218,88, the *Area* thereof will be 37642,1357, and its Height muſt be but ,2, two Tenths of an Inch; ſo will the Content of that ſhort Cylinder be, 7528,427: Wherefore the Contents of both parts of this Figure being added together, will be 5241047,985. This Sum being divided

divided by the ſolid Inches of the Bath 1747, will give in the Quote 3000, with an inconſiderable Fraction overplus, which I allow'd, becauſe I would not affect overmuch preciſeneſs, neither would I take too little. By this Proceſs I have both demonſtrated the Defect of the *Talmudiſts* Figure, and alſo ſhew'd how it may be mended, ſo as to ſerve the End for which it was intended; *Rectum enim eſt index ſui & obliqui.* And now I ſhall leave it to the Reader's choice, either to take the Figure with a protuberant Belly, which I before propoſed, which ſeems more Ornamental, being like that of the Ciſterns uſed in Noble-mens Dining-rooms; or to take the Talmudical Figure with this Emendation which I have offered. And I have thought fit to examine this Talmudical Notion the more diligently, both becauſe the learned Dr. *Lightfoot* in the place fore-quoted doth (according to his uſual modeſty) deſire it might be conſidered; and becauſe it ſeemed to me proper to oppoſe this Doctrine of the *Talmudiſts*, con-

cerning the Figure of this Molten Sea, to the Conjecture of *Josephus*, who intimates it to have been Hemispherical, (which Geometry demonstrates to be insufficient for the reception of so many Baths; and it's certain he had never seen it, for it was broken and carried away at the Captivity, *Jer.* 52. 17, *&c.*) and their Authority concerning things Sacred, weigh much more among the Jews, than any Opinion of his.

CHAP.

CHAP. IV.

Of Shekel, *and other Weights and Coins thence determined.*

I Shall not diſtinguiſh between *Shekel* conſidered as a Weight, and the ſame as a Coin, having no concern to enquire about the Letters and Impreſs that it bears, but only to expreſs its Weight, in Weight known among us, whence its Value in our Coin will eaſily be deduced. I conceive that it was juſt of the Weight of half an ounce *Averdupoiſe*, now and anciently uſed here in *England*; or it weiged 219 Grains uſed in our *Troy*-Weight, and ſo wanted 21 Grains of the half Ounce *Troy*.

This is proved;

1. By many *Shekels* ſtill remaining that differ not ſenſibly from this Weight, which may reaſonably be thought to have been tried by the Jew-

iſh Standards, when they were coined. Of theſe *Villalpandus* reckons up many; and *Greaves* two; one in the Library of King *Charles* the Firſt, of Bleſſed Memory, weighed by Arch-biſhop *Uſher*; and another in Mr. *Selden*'s, weighed by himſelf, as he witneſſeth, in his learned Treatiſe of the Roman *Denarius*, p. 76, *&c.*

I have alſo ſeen and weighed two *Shekels* with Samaritan inſcriptions on them (which although I had not opportunity to weigh them to a Grain) yet I do teſtifie they weighed within a very few Grains, as is above expreſſed. Nor can I find any ſufficient reaſon to reject theſe as counterfeit; and if any will believe them to be ſuch, yet it muſt be acknowledged, that they are made ſo as to agree in Weight with the Teſtimonies of the Ancients, which is ſufficient to our purpoſe, becauſe their value in our Coin may certainly be deduced thence. For ſince it's known that now, by the Laws of our Mint, 62 pence are coined out of every *Troy* Ounce; it will follow that 2 *s.* 4 *d.* and a farthings worth of Silver, with 3 Cen-

Centeſimals of a Penny over, muſt be contained in 219 Grains, which is the Shekel's weight. By this Analogy; as 480 *s.* are to 62 *d.* ſo 219 *s.* are to *d.* 28,28 Decimals of a Penny, which make 1 Farthing, and near the 8*th* part of a Farthing.

My ſecond Argument is taken from Teſtimony of Antiquity, thus: The *Shekel* was equal to the Roman half Ounce, but that was 219 Grains of our *Troy* Weight: therefore ſo was the *Shekel*. The *Major* is affirmed by *Jerom* on the 4*th Chap.* of *Ezechiel*, to contain four Drachms of the Latin Ounce. The Greek Author of *Farrier*-Weights ſaith, Σίκλιον ἔχει ὀγκίας, ϛ-: which is the Mark for ἥμισυ, or Semiſſis: where Σίκλιον plainly ſignifies the *Shekel*, and is falſely rendred in *Stephanus* by *Siciliquus*, which is agreed to be but a quarter of an Ounce, whereas this is affirmed to be half, by the Author.

So alſo *Stater*, which is known to be the ſame with the *Shekel*, is twice affirmed by *Cleopatra*, to be four Drachms, which is half an Ounce.

To

To these may be added the clear Testimony of *Moses Nehemanni Gerundensis*, related in *Arias Montanus*; wherein he owns himself to have formerly doubted of this which was *Solomon Jarchi*'s Judgment, but to have been convinced and satisfied by weighing a *Shekel* with Samaritan Inscription, which was just half an Ounce. Many more Testimonies of Rabbins might be added, but I think them not necessary.

Only I will add a Testimony of *Anton. Augustinus*, concerning two fair Carthaginian Coins, weighd by him, which each of them answered to four Drachms, or rather little more. Now it's known the *Carthaginians* were a *Tyrian*-Colony, and that the Jewish Coins agreed in Weight with those of *Tyre*, the *Talmudists* affirm. Hence the *Major* seems abundantly evident. The *Minor* is vouched by *Greaves*, who diligently compared and tried the Roman Standard Ounce, with the Ounce and Grains of our Standard. And *Villalpandus*, with others, have from the Weight of Water in the *Congius* yet remaining, proved, that

that the Ancient and Modern Roman Ounce, is exactly the ſame unaltered by Time.

From hence I collect, or conclude alſo, that our Engliſh *Averdupoiſe* Ounce alſo, being (as I before ſhewed) the ſame with the Roman Ounce, when they are both reduced to Grains of *Troy*-Weight, was probably introduced into our Kingdom by the Romans, when they gave Laws, and planted Colonies here, and hath thence continued unchanged to this day; which is not commonly obſerved, becauſe we uſe the *Averdupoiſe* Weight only about heavier Commodities, not in weighing Silver and Gold, and therefore do not divide that Ounce into Grains, as we do the *Troy*-Ounce, which I ſuppoſe was introduced by the Normans, becauſe it take its name from a French Town *Troyes* in *Campaigne*. I may add alſo, that it's probable hence, that both the *Roman* Ounce, and our *Averdupoiſe* Ounce, had their more remote Original from the Eaſtern *Shekel* doubled: and evidence may be given, that ſuch Weights

and

and Coins, consisting of two *Shekels*, were sometimes used in the East by the name of *Selahs*; but I must not digress farther.

A third Argument may be taken from the constant Tradition of the Jews, that their *Shekel* weighed 320 common Barly-Corns, in *Schalsheleth*: but these Corns ordinarily answer 219 Grains of our Weight; therefore, *&c.* Nevertheless it must be acknowledged, that there is no perfect constancy in this matter of Experiment, which I have made with success; yet variety of a few Grains will frequently fall out. But because Nature alters not much in the Weight of ordinary Barley, this may be accepted as a Proof, that we have assigned *Shekels* Weight, at least very near to exactness: but perfect accuracy is rather to be sought in the former Arguments, which bear upon the Jewish and Roman Standards, than on this which resolves it self into Nature's Constancy, to produce Grain near alike in different Times and Places; but yet doth

reserve

reſerve to her ſelf a liberty of making ſome variety.

Such was the *Shekel* of the Sanctuary, or agreeable to the Standards of Weights and Meaſures there kept. Another *Shekel* half ſo heavy, is contended for by ſome Modern Jews and Chriſtians: I confeſs I am not ſatiſfied that there was any ſuch *Shekel.* A piece of that Weight I acknowledg, but conſtantly it bears the Inſcription of half a *Shekel*, called a *Bekah*, *Exod.* 38. 26. However, it is ſufficient that my care to determine the Sanctuary *Shekel*, doth fully determine alſo the Weight of its half, which muſt be 109 Grains and a half. They who are willing to ſee Arguments on both ſides, may find them in *Hottinger de Cippis*, p. 110, *&c.* to whoſe Judgment I have nothing material to add. Alſo the near approach of the Roman *Denarius*, and of the Attic *Drachma*, to the fourth part of the *Shekel*, together with their difference from each other, and from the preciſe quarter of a *Shekel*, is well ſtated by *Greaves*, diſtinguiſhing the intrinſick Value

Value riſing from meer Weight, and the extrinſick riſing from the Stamp, and Laws peculiar to ſeveral Kingdoms, in his Treatiſe fore-quoted, to which I therefore refer the Reader; my Buſineſs being only to give the true Weight and Value of *Shekel* in our Engliſh Coin, and not to compare it with thoſe Foreign Coins for which it was ſometimes exchanged by the *Trapezites*, who made conſiderable advantage by the Trade.

The Conſequents of our thus ſtating the *Shekel*, are theſe.

1. Hereby all its Parts, and the leſſer Weights or Coins, in known proportion to it, are determined: particularly hence it follows, that the *Bekah*, or half *Shekel*, is in Grains *Troy* 109,5. The quarter thereof, called *Zuza* by the *Talmudiſts*, is Gr. 54,75. Its twentieth part, which is called *Gerah*, *Exod.* 30.13. and is underſtood to be the ſame with *Agurah*, 1 *Sam.* 2. 36. by *Rab. Solomon* and *David*, though we tranſlate it indefinitely a piece of Silver, muſt be Gr. 10,95: which wanting but the

the twentieth part of a Grain of eleven Grains, may paſs for juſt ſo many. And accordingly is well tranſlated in the *Septuagint*, by the Greek ὀβολὸς: for there are *Attic Oboli* ſtill remaining of this Weight mentioned by *Greaves*, which give another Argument to evince, that the *Shekel*'s Weight hath been rightly ſtated by us, becauſe its twentieth part, the *Gerah*, or ὀβολὸς, is found by the remaining Coins to be right.

And it's highly probable, that the Athenians being a Colony, partly from *Egypt* under *Cecrops*, partly from *Phænicia* under *Cadmus*, brought this Egyptian and Phænician little Weight or Mony with them. I find alſo in *Cleopatra*, that the *Obolus Atticus* is called the *Drachma Ægyptiaca*, and is there affirmed to be the ſixth part of the *Attic Drachma*; and conſequently hence we may learn to reduce to ours moſt other Greek Weights, whoſe proportion to the Drachm is given us in *Galen*, *Dioſcorides*, and ſeveral other Greek Writers.

The

The Attic Drachm by this reckoning, must be in our *Troy* Weight 66 Grains; the Learned *Greaves* hath stated it 67. The difference of one Grain in so many, is so small, as not to be worth contending about; but I count my Reckoning sufficiently confirmed by its near approach to his.

But to return to our *Gerah*, or *Obolus*. The determination thereof is useful, because it's proved by *Arias Montanus*, *Wasser* and *Hottinger*, out of the *Rabbins* and *Talmudists*, that this is of the same Weight and Value with the ancient Coin called *Kesshitah*, sometimes translated a *Lamb*, probably because either of its Impress, or its old Value, being when Mony was rare, sufficient to buy a Lamb. This is mentioned *Gen.* 33. 19. *Jos.* 24. 32. *Job* 42. 11. but is expressed by St. *Stephen*, Acts 7. 16. to be a piece of Mony.

To this Head also belongs the Investigation of the *Darchmon* or *Adarcon*, both which words, by the *Septuagint*, are translated δραχμὴ, as

as both ſignifying the ſame Coin. They are mentioned 1 *Chron.* 29. 7. *Ezra* 2. 69. *Nehem.* 7. 69, 70. Our Learned *Brerewood* hath ſuggeſted, that the *Septuagint* underſtands by δραχμὴν, not that of *Athens*, but of *Alexandria*, which was double thereunto, and therefore is known by its help: but he adds alſo, that both theſe names of Coin, relate to thoſe Golden Pieces coined by *Darius*, and thence named by the Greeks Δαρεικοὶ.

But our beſt help to underſtand theſe Pieces, is from the *Scholiaſt* on *Ariſtophanes*, and *Harpocration*, who both affirm, that they weighed as much as the Attick χρυσοὶ, which *Pollux* and *Heſychius* aſſure us weighed two Attick Drachms; that is, by our Account 132, or by *Greaves's* 134 Grains *Troy*. The forenamed *Scholiaſt* ſaith, that the *Darius* who coined theſe Pieces, was elder than that *Darius* who was *Xerxes* his Father. Now I find no *Darius* elder than him but *Darius* the *Mede*, whom *Daniel* mentions twice; but I find

him not mentioned by this Name among the Ancients any where elſe, ſave in this Paſſage of the *Scholiaſt*, and conſequently in theſe Coins, which he explains. And beſides, this evinceth it poſſible and probable, that the chief Fathers of the Jews returning under *Cyrus*, might bring with them much of that Mony, which had been coined by *Cyrus* his immediate Predeceſſor, to make an Offering to Sacred Uſes, as is mentioned *Ezra* 2. 69. where we tranſlate it Drachms; but are to underſtand, ſuch as *Brerewood* calls *Alexandrian Drachms*, or double Attick Drachms. For each *Daric* contained more than two of our Drachms *Troy*, which are but 120 Grains; whereas we have ſhewed theſe to be about 132, or more.

Now the Weight being ſtated, the Reduction to the preſent Value of our Mony, is not difficult: but it muſt be remembred, that this is not ſo conſtant as Weight, but is altered for Reaſons of State, more frequently, both in our Kingdom, and in others.

thers. However it's fit to be known, that now, out of every Ounce *Troy* of Gold, taken with its appointed Alloy, there is coined in Gold Coins, the Value of 3 Pounds *Sterling*, 14 Shillings, and 2 Pence: which is expreſſed in Shillings, and Decimals thereof, thus, *ſh.* 74,1664. Wherefore ſuppoſing the *Daric* Gold, and ours of the ſame goodneſs, we may find its Value in our Mony by this Analogiſm: As the Ounce *Troy*, which is 480 Grains, is to the *Doric*, which is 132 Grains. So is *ſh.* 74,166, to *ſh.* 20,395. The fourth term ſhews, that the *Daric* amounts to 20 Shillings, and about 4 Pence, which is about a third part of a Shilling. And by the ſame method, the whole Sum of *Darics*, which we tranſlate Drachms in *Ezra*, may be computed.

Hottinger hath ſuggeſted, that *Darchemon*, is derived from an ancient Perſian word *Dram*, ſignifying both a Coin, and a Weight of twelve *Cherats*: what thoſe were he informs us not; but I find, in *Arius Montanus de Sicle*, the Arabian *Cherat*, to

be derived from the Hebrew *Gerah*, by a uſual change of *G* into *Ch*, and that it ſignifies a *Siliqua*, or the Fruit of the *Carob* Tree; and that he weighed twenty ſuch againſt his *Shekel*, and found them equal thereunto. Hence I gather that each *Cherat* weighed 11 Grains *Troy*, and therefore twelve of them amounted to 132 Grains; which agrees with our former Inveſtigation of the *Daric*, and ſhews the Perſian Drachm to be juſt double to the Attick. Now, though I know ſuch a *Cherat* differs much from the Greek κεράτιον, in *Dioſcorides* and *Cleopatra*; yet in this eſtimate of an Eaſtern Coin, I prefer *Arias Montanus* his Eyes, and his Scales, atteſting the Weight of a *Siliqua*, or *Cherat*, before the Teſtimony of thoſe Fragments, which in many Inſtances are corrupted.

Becauſe the Roman Coins mentioned in the New Teſtament, had ſome relation to the *Shekel*, being ſeveral of them often exchanged for it, and all of them parts of the Roman Ounce, which we have ſhewed to be

two

two Shekels. I ſhall briefly on this occaſion ſtate their Weight and Value reduced to ours. The only Silver Coin of the Romans, there ſpoken of, is the *Denarius*, which under the *Cæſars*, in whoſe time Chriſt and the Apoſtles lived, was a little leſs than the Conſular *Denarius*, of which *Greaves* hath writ very learnedly. By help of ſome of them which have fallen under my examination, and by taking half the Weight of the *Aurei* of ſuch *Cæſars*, which *Greaves* hath given us, and prov'd that their *Denarii* were ſubduple thereunto; I eſtimate their Weight to be about 60 Grains of our *Troy* Ounce. Hence their Value in proportion to our Mony (which now hath 62 Pence in an Ounce *Troy*) is 7 Pence 3 Farthings.

The other Roman Coins mentioned in Scripture, were Copper, and are all known parts of the Roman *As*, or *Aſſis*, which before, and long after Chriſt's Time, was juſt half a Roman Ounce, and ſo equal in weight to the *Shekel*: but its Value was but the tenth part of the *Denarius*, which is

in our Mony but three Farthings, and a tenth of a Farthing, thus written *f.* 3,1. Hence it follows, that the *Assarium*, mentioned *Matth.* 10. 29. which is determined by *Cleopatra* to be $\frac{1}{4}$ of the Ounce, must in value of our Coin be *f.* 1,55 a Farthing and an half. Hence also *Quadrans*, mentioned *Matth.* 5. 26. which is $\frac{1}{4}$ of *As*: or $\frac{1}{16}$ of their Ounce, is little above three quarters of our Farthing, exactly ,77 Centesimals of it. And half this λεπτὸν, which we translate a *Mite*, is ,38 Centesimals of a Farthing, or about a third part of a Farthing; yet was in weight half a Drachm of their Ounce, mentioned *Mark* 12. 42.

The Weights less than *Shekel* being thus stated, thereby we shall, secondly, pass to the determination of those which are greater, and may be called Sums of *Shekels*.

I. The *Talent*.
II. The *Maneh*.

I. A

I. A *Talent* was 3000 Shekels, as may be collected by halving the Number of the Iſraelites (becauſe each one brought half a Shekel) which half of their Number is 301775, and is the Sum of the Shekels which they all contributed. Now *Moſes* aſſures us, *Exod.* 38. 25, 26. that theſe amounted to 100 Talents, with 1775 Shekels more: wherefore that Number which dividing 301775, will quote 100, and leave 1775 in remainder, is the number of Shekels in a Talent: but only 3000 will do this; therefore 3000 Shekels are a Talent.

Hence we may eaſily reduce the Talent to Ounces, or Pounds *Averdupoiſe*, uſed in Weight among us; for we have ſhewed two Shekels to be our Ounce *Averdupoiſe*; therefore 1500 Ounces are in a Talent; which Number divided by 16, the Ounces of a Pound *Averdupoiſe*, gives the Pounds *Averdupoiſe* in a Talent, thus 16)1500 (93,75. The Quote ſhews that 93 Pounds and three quarters of a Pound *Averdupoiſe*, are in a Talent. This

Weight is the ſame now, and in former Ages: but the Value of this Weight of Silver or Gold, alters in ſeveral Ages conſiderably, as Coins do every where.

However, the Value of a Talent;

1. Of Silver.
2. Of Gold.

In Mony now uſed, may be thus ſtated.

1. Every Shekel is in Pence of our preſent Silver Mony 28,2875, for I now compleat the Decimals of a Penny, formerly omitted in eſtimate of a ſingle Shekel, as inconſiderable; but now, being to be multiplied by 3000, they will grow conſiderable, and give the Pence of a Talent to be 84862,5: Theſe divided by 12, give the Shillings thereof 7071,875: The Shillings and Decimals thereof divided by 20, give the Pounds *Sterling*, and parts thereof, *l.* 353,59375; the Decimals are equal to 11 Shillings 10 Pence half-penny.

2. A Talent of Gold may hence be valued compendiouſly thus. Gold is now to Silver of the ſame Weight,

As

As 14,356 to 1:
Wherefore multiply the } *l.*
Silver Talent ——— } 353,59375
By ——————— 14,356
The Product will be—5076,191875

Which is ——— 5067 *l.* 3 *s.* 10 *d.*

The Value of Gold above Silver hath grown, ſince the Roman Conſuls Time, from 10 to above 14 and a third; and I gueſs it will grow ſtill higher.

Secondly, and laſtly; By help of the *Shekel*, we come to underſtand the Jewiſh *Maneh*, which was a round Number of *Shekels*; but with ſome variety in the Numbers thereof.

The beſt reſult of my ſearch into this is, in theſe two Propoſitions.

1. That *Maneh* being ſet for a meer Weight, without reſpect to Coinage, contained juſt 100 *Shekels*. This ſeems clear, by comparing 1 *Kings* 10. 17. (where it's ſaid, that in each of *Solomon*'s Shields, were three *Manehs*, or, as we tranſlate it, Pounds of Gold).

Gold) with 2 *Chron.* 9. 16. where our Tranſlation affirms, that 3000 *Shekels* of Gold, went to one of theſe Shields. And indeed, although the word *Shekel* be not in the Original expreſt, yet it muſt be underſtood; becauſe *Ezekiel* aſſures us, *Ezek.* 45. 12. that by the *Shekel*, the *Maneh* was adjuſted. And *Pollux*, lib. 9. c. 6. affirms, that when we ſay a Golden One, we underſtand a ſtater; as when we ſay a Silver piece, we mean a Shekel, although we expreſs it not.

2. When the *Maneh* is ſet for a ſum of Mony, or Coin, it contains but 60 *Shekels*. To this number the parts of a *Maneh*, in *Ezek.* 45. 12. added together, do amount. And *Joſephus*, lib. 14. 12. affirms, the Jews μνᾶ (which is derived from *Maneh*) to be two Pounds and an half, which reckoning 12 Ounces to the pound, as the Greeks and Romans in his time did, is juſt 30 Ounces, which we have ſhewed to be juſt 60 *Shekels*: and *Rabbi Gedaliah*, in *Schalſh* agrees with him. Neither is it unuſual to take the ſame word in one ſenſe, when it relates to meer

meer Weight, as we do a Pound (meaning thereby the Pound *Troy*, uſed in weighing Silver) for 12 Ounces; and in another ſenſe, the ſame word Pound, when it relates to Mony, meaning thereby the Pound *Sterling*, which of Silver Coin contains not quite four Ounces; and of Gold contains not quite the third part of an Ounce.

I will not digreſs to conſider the great variety of *Minæ*, uſed among the Greeks and Romans, but only ſuggeſt that the various import of the word in theſe Nations, ſeems to have proceeded from the inconſtancy of its ſignification in the Oriental Tongues, from whence it is derived.

I will conclude with an obſervation of the Harmony or good Correſpondence of the Meaſures and Weights thus ſtated. The Cubit will lead to all the Meaſures, and to the *Shekel*, with the other Weights thence derived: and reciprocally the *Shekel* will lead, not only to the Weights, but to all the other Meaſures. Thus take the

Cubit

Cubit from the Egyptian Standard; its Cube is *Ardob*: the ſixth of that is *Epha*, whoſe tenth is *Homer*, its tenth *Cotyla*, its tenth gives an Ounce *Averd.* of Water, half that gives the *Shekel's* weight preciſely. So reciprocally take a true *Shekel* (as divers ſtill remain) that doubled gives an Ounce of Water, this ten times is *Cotyla*, this ten times *Homer*, ten ſuch are *Epha*, ſix *Ephas* an *Ardub*. Its Cube Root will agree with the Standard-Cubit of *Egypt*.

I will conclude this Diſcourſe with the Propoſal of a Method, whereby this Doctrine may be made uſeful to all Nations, moſt of which are unacquainted with our Engliſh Standards of Meaſure, or Weight, to which only I have made my Principal Reduction in this Book.

This I ſhall do, by ſhewing, that either the Jewiſh Cubit, or our Engliſh Foot, may be expreſſed and underſtood by a known Proportion to an univerſal meaſure, which is either already known, or may eaſily be found by the diligent enquirer in any Nation:

tion: ſuch is a Thread with a Bullet annexed, adjuſted by carefull tryals to that length, that every ſingle vibration of it, will ſpend juſt a ſecond Minute; ſo that it will vibrate 60 times in a firſt minute. This length will be the ſame in all Nations and Ages, and may eaſily enough be found, either by help of a true Pendulum-Clock, or otherwiſe exactly enough for humane uſes. And as its Motion will ſerve to meaſure all Time, ſo its Length, by the help of Arithmetical Operations, and application, may be employ'd to meaſure all other continued Quantities. Its whole length may be called the Horary Yard, as a third part of it is denominated the Horary Foot, by the Learned Propoſer of it, *Hugenius*, in his Treatiſe *de Horologio Oſcillatorio*.

This Length being found in any Nation, may be applied to their uſual Meaſures, whereby it will appear to the Eyes, how it muſt be expreſſed in that Nation, as in ours it is expreſſed by 1 Yard, 3 Inches, 25 Centeſimals of an Inch; or by 39 Inches, 25 Centeſimals,

tesimals, whereas the Jewish Cubit was found by us to be shorter, *viz.* 21,888.

Wherefore to find what Proportion, or Rate the Universal Measure hath to the Jewish Cubit, it will be conveniet to suppose this Measure divided into Decimal Parts, 10000; and then we may find how many such parts of that Length are in their Cubit, by this Analogy.

As the Pendulum Length in our known Measure, 39,25, is to the Jews Cubit in the same Measure, 21,888, so is the Pendulum's Length in Decimal Parts, 10000, to the Jews Cubit in such Parts, 5576: 5. This fourth Proportion gives the Jews Cubit in its Rate to 10000, which are Terms most fit for general use; which was the thing sought for. Now, the Cubit being so determined, the Proportion of the side of an *Epha* answering thereunto, may be found by the Method intimated in the Harmony of Measures lately delivered. And the *Epha* being made 1000 part thereof, will give the Ounce, whose half is the *Shekel*.

Where-

Wherefore by this Method, my labour in reducing these to our English Standard, may become useful to those that know not our Standard, and consequently to all that understand the Language in which it's now written, or into which it may be translated, if it find acceptance.

Corol-

Corollaries ſhewing the Uſes of this Diſcourſe of Meaſures *and* Weights.

1. THeſe are ſenſible Inſtances of God's care of Juſtice among Men. Theſe determine every Man's Property, the Bounds of his Land, the Quantity of the Fruits thereof, and the Value of his Mony. Wherefore they are uſed, both in the firſt ſetting out of all Eſtates, and in all Traffic ſucceeding thereunto.

2. The fit Meaſures of the Tabernacle and Temple, to the uſes of the whole Nation of the Jews, demonſtrate God's early care to ſettle his People *Iſrael*, in the form of one entire National Church, under *Moſes*, *Aaron*, and the other Prieſts, who were general officers for all *Iſrael*. The Church in the Wilderneſs, mentioned by St. *Stephen*, *Acts* 7. 38. was thus National, and

and is the firſt collective Body of Men, called a *Church* in the Scripture-Language, by a Man full of the Evangelical Spirit.

Synagogues for particular Neighbourhoods convenience, in the publick Exerciſe of Religion, were introduced long after, by the pious prudence of the National Governours of the Jewiſh Church and State, and accordingly were all ſubordinate to them. It's to be obſerved alſo, that this Limited Place for publick National Worſhip, was within their own Nation, in the midſt of their Camp in the Wilderneſs, in their own Land in *Canaan*. No recourſe from it to a Foreign Church by Appeals, but all Differences finally decided within their own Nation, and therein all, even *Aaron*, although the High Prieſt, and elder Brother to *Moſes*, yet was ſubject to *Moſes*, who was King in *Jeſurun*. By theſe means all Schiſmatical ſetting up of one Altar againſt another was prevented; National Communion in ſolemn and decent Piety, with perfect Charity, was promoted;

which being no Shadows, but the moſt ſubſtantial Concerns of Religion, are to be preſerved in the Goſpel-Times.

3. Hereby is more evidently prov'd the Magnificence, Symmetry, and Beauty that was in the Structure of the Temple; and the liberal Maintenance which God provided for the Levites his Miniſters. For if the Cubit by me propoſed, determine the *Area*, both of the Temple, and of the Prieſts Suburbs (as the Scripture ſets them both out by Cubits) they muſt be much longer, than if they were ſet out by ſo many ſhorter Cubits (ſuppoſe Cubits of 18 inches) in ſuch proportion as the Squares of theſe different Cubits bear to each other: by the 19 & 20 *Prop.* of *Euclid's 6th* Book. But the Squares of theſe different Cubits are in foot-meaſure, which is here more convenient, as 3,82 to 2,25: the bigger of which, is near half as much more as the leſs. Therefore the *Areas* of the Temple, and of the Prieſts Suburbs, are according to my Meaſure

ſure, near half as big again, as they would be if determined by that ſhorter Cubit.

Such greatneſs of the Temple *Solomon* intimates to the King of *Tyre* to be requiſite, as beſt ſuiting with the Greatneſs of God, 2 *Chron.* 2. 5. This Reaſon alledged by *Solomon* to a Heathen, muſt be of moral or natural, and therefore perpetual Force, continuing to Evangelical Times; and therefore intimating to us, that even now magnificent and ſtately Buildings are uſefull meanes to ſignify what great and honourable Thoughts we have of God, and deſign to promote in thoſe that come to the Places of his Publick Worſhip. And from God's liberal proviſion of Land in the Levites Suburbs, beſides other Advantages, we are taught, by St. *Paul,* that even ſo thoſe that preach the Goſpel, ſhould live of the Goſpel, 1 *Cor.* 9. 14.

4. The Fitneſs, Safety, and Honour, of keeping conſtantly to the uſe of ſuch indifferent Things, as

have been determined by Law or Cuſtom, is clearly proved by the conſtancy of *Iſrael*'s uſing thoſe Meaſures (altho others might be aſſigned, as the Greek or Roman Meaſures, to ſerve the ſame Ends) from the Time of *Moſes*, and probably before, to the Captivity and after. And this notwithſtanding they were uſed by the Egyptians and Canaanites, which altered not their Nature in the leaſt. And this Inſtance proves undeniably, that ſuch indifferent practices, as the uſe of theſe Meaſures, may be highly uſeful to the greateſt Moral Duties, the Publick Honour of God, and the Preſervation of Juſtice among men.

Theſe Corollaries hold uſeful (excepting the Third, which bears upon the largeneſs which I have aſſigned) notwithſtanding there may be ſuppoſed ſome miſtake in my Determination of the Bigneſs of theſe Meaſures. But I hope my Reaſons will juſtify that alſo.

Beſides

Beſides theſe Uſes, it ſeems to me conſiderable, that the knowledg of Weights, Meaſures, and Coins, together with that of Numbers of all their Parts and Proportions to each other, is the prime and moſt obvious Inſtance of ſomething peculiar to Mankind above all other living Creatures, enabling Men more than them, to civil Society, mutual Commerce and Aid to each other thereby, above all that is found in the low Correſpondencies of Brutes. And agreeably to this peculiar Skill of Mankind in Numbers and Meaſures, we may remark, that the beſt Sciences which we have, *viz.* Arithmetick and Geometry, and our moſt perfect Arts, I mean, the Geometrical Doctrines of Mechanicks and Staticks, are all employ'd in this Matter, founded in the Principles of Numeration, and Menſuration, and built up by a cloſe order and coherence of Demonſtrations, ſuch as no where elſe are to be found. This was, I confeſs, the firſt Motive that made me take ſo much pains to retrieve theſe Scripture-Numbers, Meaſures,

and Weights, which are the moſt ancient of all whereof we have any Memoires.

Laſtly; The Harmony of theſe Meaſures and Weights, ſo ſtated, will evince the Wiſdom of the Ancients (probably *Noah*, or the *Antediluvian* Men) in the firſt conſtitution of them, confirms the Truth of our inveſtigation of them, and will eaſe all our Memories in retaining them, and ſhews that ſome degree of Mathematical Learning was requiſite, or highly commendable in the Moſaical Prieſts, who were to be Overſeers of their Meaſures and Weights.

A Table

A Table of the Principal Meaſures, &c. herein contained.

I. *Of Length.*

	Inch Decim.
1. The Jews Cubit in Engliſh Inches	21,888

Hence are deduced;

1. Its Parts, or leſs Meaſures.

Zereth, the Span, ½ a Cubit	10,944
A Palm, Hands-breadth, ¼	3,648
A Digit, Fingers-breadth, 1/24	,912
The Eaſt uſed alſo a Span ⅓ of a Cubit,	7,296

2. Aggregate Numbers of Cubits.

	Eng. Feet & Dec.
ὀργυία, a Fathom, 4 Cubits	7,296
Ezekiel's Reed, 6 Cubits	10,944
The Arabian *Canna*, or Pole, 8 Cubits	14,592
Schænus, the ancient Meaſuring Line or Chain, 80 C.	145,92
Sabbath days Journ. 2000 Cub.	3648

	Feet.	Mil. Engl.
The Eaſtern Mile 4000 Cubits	7296	1,3816
The *Paraſang*, — 12000 Cubits	21888	4,1454
The 30*th* part thereof is a *Stadium*, as *Herod.* and *Heſychius* witneſs, — 400 Cubits,		,13816
the 11*th* part of an Eaſtern Mile		729,6 *feet Eng.*
Their days Journey not always equal, but ſet by *Abulfeda* at a middle rate, eight *Paraſangs*, or 96000 Cubits		33,1632

II. *Table*

II. *Table of Measures of* Capacity.

	Sol. Inches.	*Wine Gal.*	*P.*	*Sol. Inch.*
Epha, or *Bath*,	1747,7	7	4	15,2
Corus, or *Chomer*, *viz.* 10 *Epha*'s	17477	75	5	7
Seah the third of *Epha*	582,5	2	4	3
Hin the sixth	291,25	1	2	1,5
Homer the tenth	174,77	0	6	0,5
Cab the eighteenth	97,03	0	3	10
Log the seventy-second	24,25	0	0	24,2

Add the Syrian μετρητὴς — *Congio Romano* — in solid Inches — 207,06 — 7 Pints English Wine-measure, and about half a quarter of a Pint.

III. *A*

III. *A Table of Weights and Coins.*

The Shekel of Silver juſt half a Roman Ounce---to half our *Averdupoiſe* Ounce in *Troy* Grains---219, in value of our Mony, *pence* 28,28, that is, 2 Shillings, 4 Pence Farthing, with three Centeſimals of a Peny above it, which are near $\frac{1}{4}$*th* part of a Farthing.

Hence the half and quarter of Shekel are known.

Half a Shekel is called *Bekah.*

Its twentieth part, called *Gerah* and *Agurah* (well tranſlated by *Obolus Atticus)* and *Keſhitah.*

Hence a Talent of Silver---3000 Shekels, is in our Silver Coin, *l.* 353,59375, or 353 *l.* 11*s.* 10*d. ob.*

Talent of Gold, 5076 *l.* 3*s.* 10*d.*

Hence *Maneh* in meer Weight, 100 Shekels, in Coin 60.

The Golden *Darics*, or Perſian *Darchemons*, 12 *Gerahs*, value 1 *l.* 0. 4 *d.*

The

The Roman Silver *Denarii*--7 *d.* 3 *far.* Gold Coins double in Weight.

Their Brazen or Copper *Aſſes*, $\frac{1}{2}$ ounce Weight, in value 3 Farthings, and 1 tenth of a Farthing.

Half this was *Aſſarium*, 1 Farthing, and 55 Centeſimals of a Farthing.

Hence *Quadrans* is little above 3 quarters of our Farthing in value: And half this, called λεπτὸν, tranſlated a *Mite*, is about 1 third of our Farthing in value.

POSTSCRIPT.

BEcauſe my exacteſt determination of the *Epha* is founded in the proportion of $\frac{1}{x}$ which it bore to the Egyptian *Ardub*, the Cube of their Cubit; I entreated my Learned Friend, Dr. *John Moore*, to enquire of Dr. *Pocock*, the great Oracle in Eaſtern Learning, whether or no he had met with any other Authority, beſides what I have before mentioned, whereby that pro-

proportion may be proved. In his obliging Anſwer, which came after my Book was finiſh'd, I find that he hath confirmed it, from the chief Arabian Lexicographer, the Author of the Dictionary called *Kamus*; who expreſly affirms *Ardob* to be a great Egyptian Meaſure, containing ſix *Waibahs*. And he hath alſo confirmed my Judgment, that *Waibah*, or *Oeba*, is the ſame with *Epha*, by the Authority of *Abu Walid* the great Grammarian.

THE END.

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